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# PHILIPPINE AGRICULTURE, A PROBLEM OF ADJUSTMENT . . . . .

By Owen L. Dawson\*

## PART I: RESOURCES AND HISTORICAL DEVELOPMENT; PROBLEMS OF FUTURE ECONOMY

*With political independence approaching, the agricultural economy of the Philippine Islands demands increasing attention. This discussion presents a general picture of the country's agriculture and of the problems involved in its adjustment to a status of nonpreferential trade with the United States.*

*As a result of physical conditions and historical development of the Islands, problems of land use, land tenure, and resettlement now confront the Philippine Government, as well as problems of essential credit facilities, adequate supply of mobile farm labor, improved facilities for marketing, and transportation, warehousing, and market information. Policies to cope with these problems are being earnestly considered by public agencies. In carrying out measures for economic improvement, the country's financial position is basically important; it has lately been improved by the return from the United States Government of excise taxes collected on imported Philippine coconut oil.*

### THE RESOURCES AND PEOPLE OF THE ISLANDS

#### GEOGRAPHIC FEATURES

The Philippine Islands lie southeast of Asia between the parallels of 4°40' and 21°10' north latitude and meridians 116°40' and 126°34' east longitude. It is a little over 100 nautical miles from the northernmost islands to Taiwan (Formosa) and approximately 800 miles to the main islands of Japan. The Netherlands Indies are but a few miles to the south, with French Indochina to the west.

The Philippines consist of 7,091 islands, of which only 2,441 are named and only 1,095 are sufficiently large and fertile to be inhabited. The land area comprises 114,400 square miles, approximately equal to that of New England and New York. It is about one-fourth smaller than Japan proper, and 6 percent smaller than the British Isles, but more than twice as large as either Java or Cuba. There are 11 important islands, each of which has an area of more than 1,000 square miles: Luzon, 40,814 square miles; Mindanao, 36,906; Samar, 5,124; and Negros, Palawan, Panay, Mindoro, Leyte, Cebu, Bohol, and Masbate. The Islands have a total coast line of 20,260 miles, compared with 12,877 miles of the United States coast. There are a number of harbors and many bays and gulfs of importance. Manila Bay has the best harbor in the Far East.

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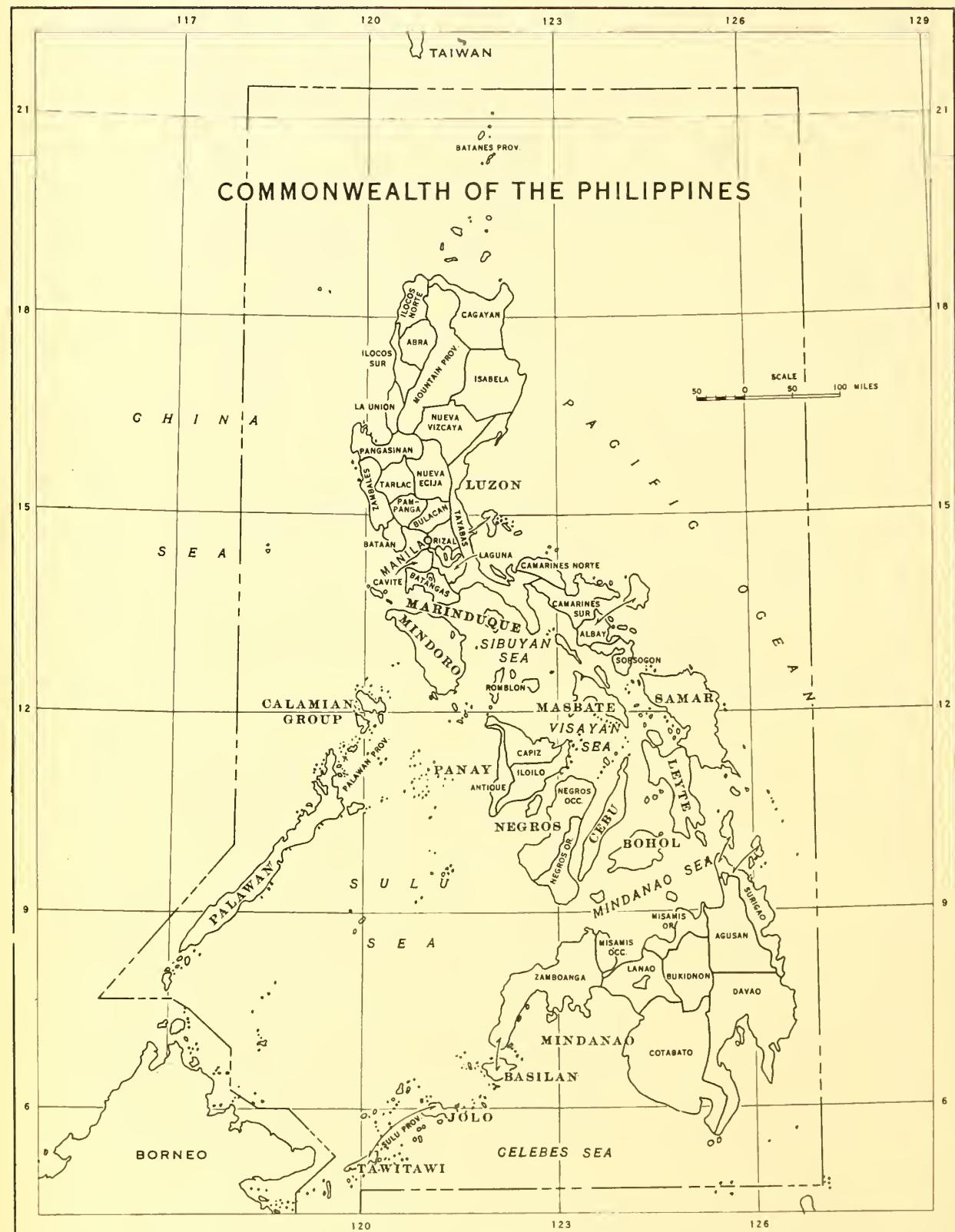


Figure 1.—Map of the Philippine Islands.

#### TOPOGRAPHY

The topography of the Philippines exhibits a wide range of variations, important to the development of the country. The Islands have no fundamental topographic disadvantages. The problem of erosion, due to the washing of uncovered hills and mountainsides by heavy rains, can be solved by the removal of some of these areas from cultivation, and by reforestation.

Small areas lying between ranges, which will probably continue in cultivation, present problems of transportation and diversification of crops to assure their people an adequate standard of living. Extensive coastal plains and numerous river valleys and uplands can be made accessible through expanding and improving transportation systems, an undertaking justified by the agricultural resources of these areas.

The Islands are largely mountainous. The numerous mountain forests are a source of timber, and if properly developed and protected offer a means of conserving and regulating the water supply. The mountains also contain important minerals and offer a refuge from the heat of the lowlands. In places, tablelands allow the production of certain Temperate Zone commodities. The elevation ranges from sea level to 9,450 feet at Mount Apo in southeast Mindanao, the highest peak.

The island of Luzon comprises more than one-third of the total land area. The central plain extends some 4,000 square miles from Manila northward to the Carballo Mountains, which separate it from the rich valley of the Cagayan. This fertile valley extends northward for 120 miles, between the mountain ranges of the Cordillera on the west and the Sierra Madre on the east, and includes some 10,000 square miles of land. The Cordilleras contain many deep valleys and cultivated slopes, including the famous rice terraces of the mountain provinces.

The western coastal plain of northern Luzon contains some very old cultivated areas. The eastern coastal plain is little developed and in parts unexplored. Southern Luzon is mostly of volcanic origin, characterized by rolling hills and short valleys.

The outstanding features of Mindanao, the island having the greatest undeveloped agricultural resources, are two valleys, the Cotabato and Agusan. The Cotabato Valley is the largest in the Philippines, containing some 18,000 square miles. It is drained by the Rio Grande, and in the south runs through rich agricultural and forest land. The Agusan Valley to the east, consisting largely of marshlands, is 93 miles long and 17 miles wide, west of which lies the Bukidnon Plateau. From the west of Mindanao Island juts the Zamboanga Peninsula, separated by a narrow strait at the southern end from the island of Basilan, where rubber production has been developed. Between the peninsula of Zamboanga and Borneo lies the Sulu Archipelago, composed of numerous small islands, the principal ones of which are Jolo and Tawitawi.

The island of Mindoro is mountainous, but has rather extensive coastal plains. The Visayan Islands are more rugged than Luzon and contain relatively less cultivable area.





Figure 3.—Scene on the island of Mindanao. Note the open, prairie type of country.

The island of Panay in the Visayan group has a large central plain, with a mountain range on the west coast and a smaller one on the east. The important sugar-producing island of Negros has a high central range, and plantations lie along the coastal plains on the east and to the north and northwest. Cebu, the most densely settled of the Visayas, is marked by steep hills and ridges and deep, short valleys. Small farms persist on the steep slopes, furnishing unsurpassed examples of slope farming. The main producing areas are along the coastal plains.

Palawan, somewhat to the west of the Visayan group, is characterized by a mountainous ridge running practically the whole length of the island. Only small coastal areas are available for cultivation, and agriculture is as yet little developed.

Nearly all the principal islands have important river systems. There are a number of lakes, but not many are large enough to be of much importance. A few large rivers are navigable for steamers, and many are useful for light craft in transporting products to market. Many streams are potential sources of water power, which might be used for industrial or household purposes.

#### CLIMATE<sup>1</sup>

There is a tremendous variation in the amount and distribution of rainfall. The rainfall in some of the important grain and sugar sections ranges from 60 inches

<sup>1</sup> Adapted from publications of the United States Weather Bureau.

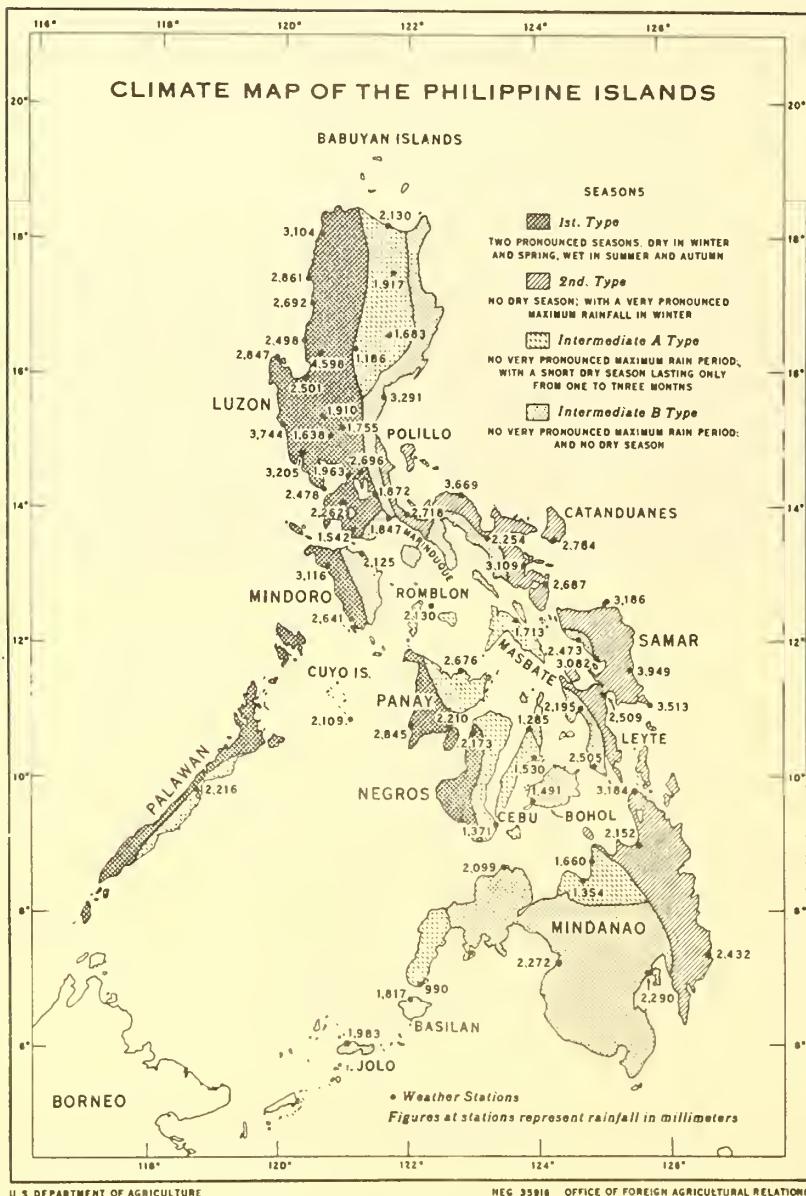


Figure 4.—Climate map of the Philippine Islands.

in the eastern part of the archipelago; in summer and autumn, they are brought by winds from the east-southeast to west-northwest. These rains are heaviest in the western part of Luzon and the Visayan Islands. Figure 5 shows the distribution of rainfall at various selected stations in the Philippines.

The Islands are not generally subject to extreme drought to the point of crop failure and famine, although dry weather periodically reduces crop production in certain localities.

to 100 inches annually, but in some of the sections where coconuts are produced it is more than 100 inches. In Baguio, an average annual rainfall of 187 inches is recorded. The annual and seasonal distribution of rainfall differs considerably within a few miles, affecting the varieties of crops and times of planting and harvesting.

The position of the Philippines, extending over a long stretch of ocean, and their general topography (narrow and frequently having mountain ridges parallel to the coast line) cause them to be much affected by winds, which make the climate distinctly different in various sections. In winter northeastern air currents from the Pacific cause heavy rains

FIRST TYPE-TWO PRONOUNCED SEASONS: DRY IN WINTER AND SPRING,  
WET IN SUMMER AND AUTUMN

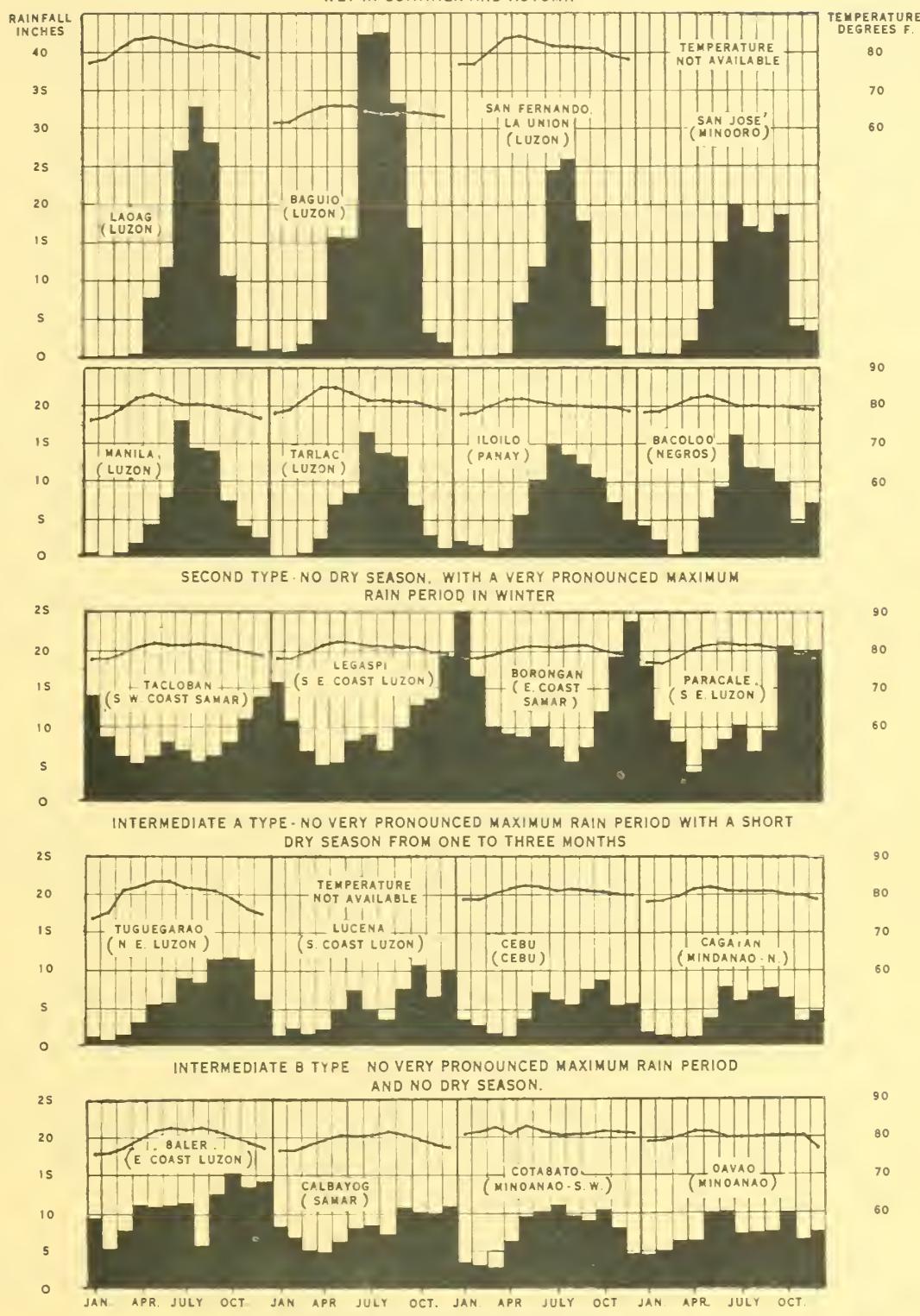


Figure 5.-Types of monthly distribution of rainfall in the Philippines and average monthly temperatures. (Compiled from data of the Philippine Weather Bureau.)

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The heavy rainfall within a short season results in high water and frequently in floods, which cause much soil washing and difficulty in transportation, affecting the marketing of crops in interior sections. Despite the handicaps of occasional drought and floods, almost every important tropical product can be produced somewhere in the Islands.

The United States Weather Bureau has divided the distribution of rainfall in the Philippines into four chief types. The first is marked by two pronounced periods - dry winter and spring, and wet summer and autumn. Only the summer rainfall is important; that in the autumn is much lighter. The second type has no dry season, but a very pronounced maximum rainfall in winter. The minimum monthly rainfall occurs in some places in spring and in other places in summer. The third has no period of very pronounced maximum rainfall, but a short dry season lasting only from 1 to 3 months. This occurs in some places in winter and in other places in spring. The fourth has neither a very pronounced maximum-rainfall period nor a dry season.

Such diverse rainfall distribution makes improvement possible in agricultural production through the selection of crop varieties to meet the extreme conditions, together with the judicious planning of supplemental crops. The distribution of rainfall greatly affects the crops that need continuous rain throughout the year, as well as the adaptation of crops that require abundant moisture during part of their growing period, but dry weather for harvest. Certain crops are much less productive in localities that do not satisfy their particular moisture requirements. With careful crop management and irrigation, double cropping has been found to be possible in some areas.

Since the Philippines lie in the tropics, the average temperature is high through a large part of the year, except as it is modified by topography and by air and ocean currents. Mean annual temperatures for the various sections do not differ materially, and any difference there may be is chiefly due to prevailing winds rather than to difference of latitude. The annual mean temperature of the whole archipelago is 80°F. Frost occurs very rarely and is observed only occasionally at some of the high stations.

As a rule, the climate is not inimical to the population. During the hottest part of the year many of those living in the cities seek relief in the high altitudes, particularly in the mountains of Luzon. The temperature has an important influence upon the crops and is unfavorable for some Temperate Zone products, such as certain fruits, vegetables, and grain. Some of these are grown to a limited extent in the higher altitudes. The high temperatures and humidity also affect adversely the adaptation of certain breeds of Temperate Zone animals and make the problem of insect and plant disease control serious.

The relative humidity is very high, the annual average at all weather stations being about 75 percent. Typhoons frequently occur. These affect chiefly the island of Luzon and occasionally do extensive damage to trees and crops.

## LAND RESOURCES

The total area of the Philippines is 73,215,000 acres, of which approximately 10,400,000 acres are cultivated. This represents 14.2 percent of the entire area of the country, 23 percent of the total area available for other than forest-reserve utilization, and 66.7 percent of the area listed as cultivable land. The island of Mindanao contains a large part of the cultivable land as yet untilled. There are also large areas of rich agricultural land still available for settlement on Luzon, on the plains of Mindoro and Panay, and on the coastal plains of Leyte and Negros.

After long study, the Bureau of Forestry and Lands arrived at a scheme for classification and disposition of lands. This plan envisages the maintenance of forest reserves and timber supplies, and soil conservation.

Figure 6 gives a graphic picture of the land resources of the Philippines. It indicates that 21.25 percent, or 15,558,103 acres, is available at present for cultivation, in addition to 10,400,000 acres actually under cultivation; 46.62 percent is classified as commercial forest; 18.7 percent as cogón (bamboo groves) and open land; 2.07 percent as swamps; 0.76 percent as unexplored; and 10.59 percent as noncommercial forest.

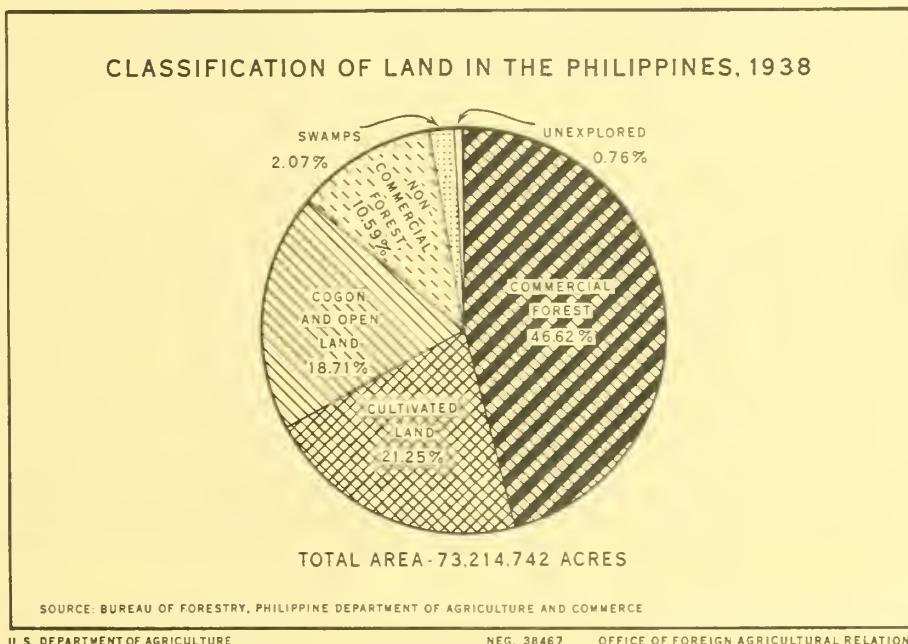


Figure 6.—Classification of land in the Philippines.

There are 45,946,000 acres that have been, or may be, disposed of under the public land laws subject to the Land Registration Act. Of this area, 14,413,000 acres are covered with forest of commercial value and 5,219,000 acres with forest of

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no commercial value. These areas are now gradually being disposed of. The lands suitable for agricultural purposes are listed as the "cultivable" areas of 15,558,000 acres, which includes approximately 500,000 acres in the sites of cities and towns, in highways, and in public improvements. The other public lands, listed as "open lands" and now covered with miscellaneous vegetation, comprise an area of 10,403,000 acres. This may eventually become productive, but the extent of its actual value for such purposes can be determined only by more detailed surveys, among which the classified soil survey is important. A comparatively small area is still unexplored.

Figure 7 shows the cropped area and the agricultural land still available for cultivation, by provinces.

#### SOILS

The land resources of the Philippines as a whole are abundant, with much new land still to be brought under cultivation. Because of continuous cropping without fertilizers and the lack of suitable crop-rotation systems, a significant proportion of the areas now cultivated is deficient in soil elements. Erosion is also responsible for depletion of extensive areas now under cultivation, and some of the land should be returned to forest.

The soils are to a large extent of volcanic origin. In some sections, particularly in the southern islands, soils are partly of coral limestone formation. The central plain of Luzon consists mostly of alluvial material of limestone, sandstone, and shale.

According to soil surveys,<sup>2</sup> clay loams predominate.

The soils of the Cagayan Valley are very fertile, ranging in composition from sandy loam to silt and clay loam. The soil here is much affected by frequent deposits from flood waters.<sup>3</sup> In certain wooded districts of the mountain provinces the soils are deficient in potash, and are often fertilized by ash.

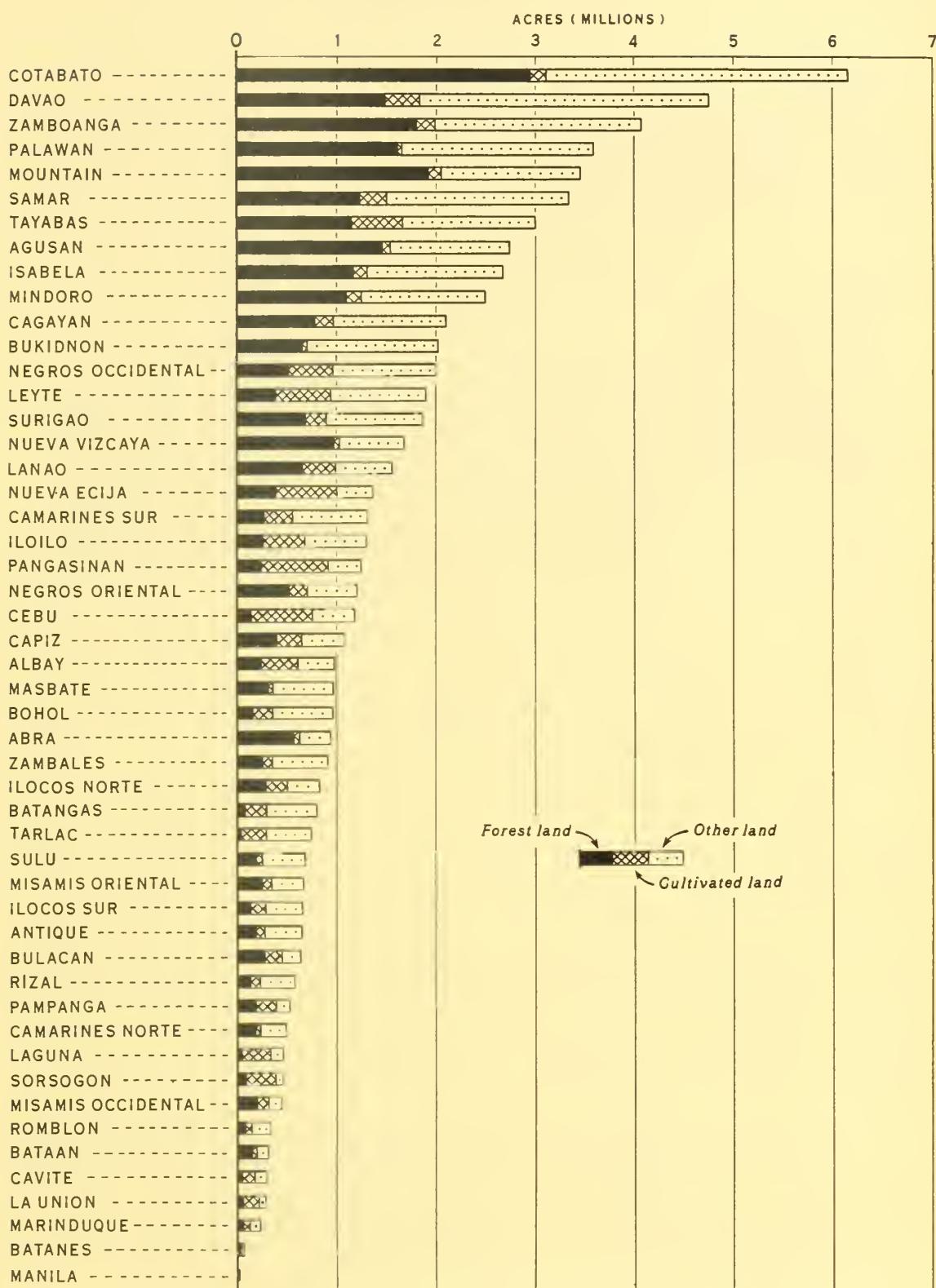
The soils of the important sugar-producing island of Negros range from limestone and sedimentary rock formation to soils of volcanic origin. The lowlands, which have most of the sugar plantations, are characterized by alluvial soil, ranging from sandy loam to clay loam. The soil of the most important sugar-producing district on the east coast is marked by a particularly high content of potash and chalk.<sup>4</sup>

Some of the croplands of Panay consist of sandy alluvial soil of high limestone content, which gives a heavy yield of cane. The soil of the Cotabato Valley, the largest area of undeveloped agricultural land in the Philippines, is characterized chiefly by deposits in the southern part of sandy loam soil of volcanic origin.

<sup>2</sup> Alicante, M. M., and others, *Soil Survey of Bulacan Province, Philippine Islands*, 1936. (See Bibliography at end of this article.)

<sup>3</sup> Cox, Alvin J., and Arguelles, A. S., *The Soils of the Island of Luzon*, 1914.

<sup>4</sup> Henry, Tress, *Technical and Financial Conditions of the Production of Sugar in the Philippines*, 1929.



## POPULATION

The population of the Islands is quite varied, as a result of numerous migrations beginning in prehistoric times. According to Dr. H. Beyer of the University of the Philippines, about 20 percent of the population is descended from known foreign sources, of which 5 percent is of Hindu, or Indian origin; 2 percent Arabian; 10 percent Chinese; and 3 percent European. A number of Malayan types also migrated to the Islands at an early period, and a few Negritos, descendants of prehistoric immigrants, are still found in the mountains and some sections of the interior.

The southern islands from about the third to the thirteenth century were at various times under the control of Indo-Malayan states. After possible previous colonization and control for limited periods by the Indochina states, Champa, and Cambodia, the Islands were under the direct control of Java and Indo-Malaya from 1325 to 1405. This period was characterized by commercial contact and more or less friendly intercourse with Java, which continued for some time.

From the tenth to the fifteenth century there was commercial contact with, and limited colonization by, the Chinese; and from 1405 and 1435 the Islands were under the rule of Chinese governors. The commercial contact with the Chinese has continued to the present time, and Chinese immigration has been the most important recent colonization. From 1435 until the arrival of the Spaniards and Portuguese, the Philippines were under Mohammedan influence, and from 1535 to 1582 Japanese colonization occurred in Luzon, together with some commercial relations between the Islands and Japan. The Dutch occupation of Formosa in 1626, however, prevented further Japanese colonization. From 1565 to 1898, the Spaniards occupied the Islands.

Most of the native Filipinos are descended from Malay stock. However, as a result of the mixture of many different races in the Philippines, there are 7 well-developed languages and 87 dialects spoken. The present total population is estimated at about 16 million. The foreign population in 1935 was estimated at 100,000 Chinese, 18,000 Japanese, 8,000 Americans, and 6,000 Europeans.

For a number of years the Chinese have controlled a large part of the trade and commercial life, although more recently there has been an extension of the Japanese influence in the retail trade. Despite the long occupation of the Islands by the Spaniards, only a small number still remain, most of whom are connected with commercial pursuits. There has been only limited American colonization, as is indicated by the above figure on foreign population.

Figures on population by provinces<sup>5</sup> indicate densities ranging from 13 per square mile in Nueva Vizcaya to 650 per square mile in Ilocos Sur. The average population density for the whole of the Philippines is 116 per square mile. As an interesting comparison the density of certain other countries is given as: Belgium, 707; The Netherlands, 673; England, 685; Japan proper, 469; Germany, 363; Italy, 355; United States, 42.<sup>6</sup>

<sup>5</sup> Maulit, Dimas, *Introduction to Agricultural Economics in the Philippines*, 1936.

<sup>6</sup> *Statesman's Year-Book*, 1938.



Figure 8.-A nipa farmhouse showing palms and fruit trees in the enclosure.

The increase in population in recent years through immigration has not been significant. Restrictions have been placed on Chinese immigration, and the arrival and departure of other nationalities over a period of years nearly balance. According to the present population trend, the total will reach some 22 million in 1960. This figure may be even larger if improved methods of disease control are developed.

#### RURAL STANDARD OF LIVING

Although conditions have improved in the past 30 years, the rural standard of living is still primitive. The farm population over a large part of the Islands is extremely poor. The farmer does not have an adequate amount of land to produce a living for his family, and his health suffers from an inadequate diet and insanitary conditions. The average peasant is oppressed by debt, and his outlook does not inspire him to progressive effort. Living conditions for the masses of farm population may be said to be poorer than in Japan, but somewhat better than in Java. Conditions of labor for some of the workers in the Philippines have been improved. The general standard of living for the majority of the rural population, however, remains deplorably low. A quotation from *Some Aspects of Philippine Rural Economy*, by José E. Velmonte, illustrates this condition:

"From the results of surveys of farm tenancies and peasant farm owners which are reviewed in this article, it is apparent that the average farm is far too small to support a decent standard of life for the farmer and his family. To support even the barest mode of living, the income from the farm often has to be supplemented by income from secondary occupations. Usury and the evils of the marketing system have reduced the

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farmer to dire poverty with debts that are often passed down from father to son and which in some cases with the most stringent economy and even with good crops he can hardly hope to pay. Under conditions like these there is little hope of making rural life happier, fuller of opportunity and more attractive.

"In one particular study (Velmonte, Sumagui, and Viray, 1934) of 240 farm families in four selected municipalities of Cavite, Tarlac and Pangasinan, an attempt was made to picture a standard of living on the farm near the minimum. It was shown that the average household consisted of about 6 persons and the total value of all goods used for one year was a little over P500. Peasant farm owners spent an average of about P580 annually per household while a tenant farm household live on a little over P400. It was found that with farms ranging in size from less than one hectare to not more than three hectares, it was not possible for a peasant farm to maintain a standard of life above the subsistence level."

#### HEALTH

The Filipino farmer needs to be healthier in order to be more efficient. The rural population subsists largely on a deficient diet of scoured rice, supplemented by fish and infrequently by vegetables and fruit - which, however, the country can produce in abundance. As evidence of widespread malnutrition, about 15,000 persons die each year from beriberi alone. About 85 percent of the rural population are infected with hookworm and roundworm, and the average death rate from tuberculosis is about 275 per 100,000. The infant mortality rate is more than twice as high as that of the United States. The death rate reported in 1936 was 19.92 per thousand, compared with 10.9 for the United States. Malaria and intestinal diseases are widespread, and epidemics of typhoid fever and cholera are frequent. It is therefore evident that health work is necessary for a program of economic improvement.

Increased attention must be given to the provision of the needed foods at minimum cost. This is a problem of both production and transportation. Large surpluses of foods are produced in some parts of the Islands, while others suffer acutely from the lack of such foods. Increased production of fruits and vegetables in rotation with major crops and in garden plots would alleviate this situation, and better provisions for transportation and marketing would make surpluses more generally available and assure prices sufficiently high to encourage the production of fruits and vegetables. Greater utilization of grassland for livestock, enlargement of meat supply by guarding livestock from disease epidemics, and improvement in fishing methods would all contribute to a more abundant and varied food supply.

Imports of foreign food products have given a greater variety to the diet of some of the people working in the cities, but the importance of the use of a variety of foods needs to be more widely taught among the rural classes. Imports will probably be limited henceforth, however, and it will be necessary to produce such foods domestically.

Plans are now being considered for a Food Research Institute for the purpose of conducting studies and surveys to make available to a larger percentage of the people the food products that can be produced in the Philippines. Some studies of this kind have already been made in the Bureau of Science, but it is planned to enlarge and systematize these studies.

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## HISTORY OF PHILIPPINE AGRICULTURE

When the Spaniards came to the Philippines they found rice, millet, coconuts, sweetpotatoes, Manila hemp, sugarcane, bananas, mangoes, and other minor crops. Early reports also mention many fowls, swine, carabao (water buffalo), and goats.

Outstanding evidences of early agriculture in the Philippines are the rice terraces of the mountain provinces. These gigantic examples of agricultural engineering are considered among the wonders of the world. The terraces cover the steep mountain sides, with sometimes more than a hundred terraces to a mountain in a series of successive layers. It is not known when these were started, but their construction undoubtedly required centuries.

### THE SPANISH REGIME

At one time or another Spain, through missionaries and traders, introduced into the country such products as tobacco, cacao, coffee, peanuts, corn, and cotton. Some agricultural improvement was instituted in 1612, when a royal decree was promulgated ordering the people to plant wheat in the lowlands. A century and a half later, another decree made it obligatory for all natives to plant every year some coconuts, cacao, Areca nuts, and pepper. In February 1768, a third decree was issued, compelling all Filipinos to plant wheat, rice, corn, and vegetables, in addition to useful trees, and to raise poultry and pigs. In 1777 the people were compelled to cultivate and manufacture cotton for exportation to Spain, according to an account by José S. Camus.<sup>7</sup> The Spaniards brought horses and cattle to the Philippines and production increased extensively for a time, but was reduced later, probably by disease.

Other early products mentioned in accounts of the trade of the Philippines are sinamay (a light fabric made from abacá), jute and other textiles, coconuts, camotes (sweetpotatoes), and spices. Quite a flourishing trade in these products existed for some time between the Islands and China.

Foreign trade was restricted to trade with Mexico from 1715 for a hundred years, and only two galleons sailed each year. The result of this policy was to reduce both foreign and domestic trade and to concentrate it into the hands of a few individuals.

Progress in Philippine agriculture during the Spanish regime was given special encouragement in the last quarter of the eighteenth century under the governorship of "argas. In 1779 he indicated that agricultural research should be undertaken in rural economics, soil improvement, plant adaptability, and improved methods of cultivation. Cash prizes were given for the largest crops of pepper, cotton, and indigo. From 1785 to the close of the eighteenth century, other agricultural laws and regulations were promulgated, such as those giving instructions for the planting

<sup>7</sup> Former Director of the Philippine Bureau of Plant Industry, in *Report No 1. National Research Council, 1935.*

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of mulberry trees; breeding of silkworms; cultivation of cotton, indigo, coffee, and tobacco; and conversion of cinnamon and nutmeg plants into commercial products.

In 1821 an agricultural advisory board was created, and a royal decree authorizing the establishment of agricultural orchards was issued in April 1822. In 1825 the reorganized Economic Society of the Philippines issued its first memorandum on abacá growing, to stimulate the development of that valuable crop.

May 29, 1861, marked the establishment of the first agricultural school in Manila. The Botanical Garden was started as a part of this school. In 1862 the government tobacco monopoly was abandoned because of scandalous abuses.

Near the close of the century agricultural experiment stations were established in many places to try out different varieties of crops and to control pests and diseases. An agricultural monthly, known as the *Boletin Oficial Agricola de Filipinas*, was published from 1894 to 1896.

Despite the various regulations for the encouragement of agriculture during Spanish times, advances in modern methods as a whole were not much in evidence, and the lot of the farmer was little improved at the close of this regime.

An interesting system of ownership of land existed in the Philippines prior to the arrival of the Spaniards. The practice had been to parcel out land among the people composing the *barangay*, or communal group, so that each had his own field to cultivate. The Spaniards made large grants of land as political favors to those who had assisted them or as an inducement to foreigners to come to the country. Controversies over these lands have persisted since that time.

#### THE PRESENT POSITION OF AGRICULTURE

The Philippine Islands are predominantly agricultural. The latest figures on trade show that exports of agricultural products amounted to 217 million pesos out of a total of 231 million.<sup>8</sup> It is believed that large-scale manufacture and heavy industry will never be an important source of national wealth. Only a few developments along industrial lines are now projected on a modest scale, with a view to making the country self-sufficient in some few essential commodities. Home industry is an important adjunct to farming, but its development has been slow and in some places has declined, owing to dependence upon imported manufactured products. A considerable revival of home industry is expected. During recent years mining (particularly gold mining) has attained some importance; however, it is not believed that this industry will ever provide an important source of income for a large portion of the population. Fisheries and forestry are important sources of national wealth, and their development is being given much consideration. It is not expected, however, that these industries will materially increase in importance compared with crops and livestock, the production of which is expected to remain the basis of Philippine economy.

<sup>8</sup> Report of the American Trade Commissioner, March 8, 1939. One peso = 50 cents.

TABLE 1.—Philippine industries as a source of national income

| INDUSTRY            | ANNUAL INCOME | PERCENT OF<br>TOTAL ANNUAL INCOME |           |
|---------------------|---------------|-----------------------------------|-----------|
|                     |               | : Thousand dollars                | : Percent |
| Agriculture .....   | 178,500       | :                                 | 56.80     |
| Livestock .....     | 5,500         | :                                 | 1.75      |
| Manufacturing ..... | 45,500        | :                                 | 14.50     |
| Fisheries .....     | 42,000        | :                                 | 13.35     |
| Mining .....        | 26,000        | :                                 | 8.27      |
| Forestry .....      | 16,750        | :                                 | 5.33      |
| Total .....         | 314,250       | :                                 | 100.00    |
| :                   | :             | :                                 | :         |

Philippine Department of Agriculture and Commerce, 1936 (latest calculated data available).

Since ancient times rice, millet, coconut, bananas, sugarcane, and other minor crops have been cultivated in the Islands. With the advent of the Spaniards, wheat, corn, tobacco, coffee, cotton, and other products were added.

Since 1909, when free trade was granted with the United States, the national economy has been built around the exportation of certain agricultural products to that protected market. As a result of the World War, an impetus was given to the demand for Philippine products in the United States and also, to some extent, in Europe. Because of the favorable natural conditions and political relations, the Philippine Islands never found it necessary to improve production and marketing and develop outstanding efficiency along specialized lines, as did some other tropical areas of the world; therefore, the Islands cannot command an important position in the world market today.

Though yields have been increased considerably by better methods of cultivation in recent years, by measures to reduce plant and animal diseases and pests, and by better marketing, nevertheless the Philippines have hardly kept pace with developments along similar lines in nearby tropical areas, particularly Java. It is doubtful whether Java is more favored than the Philippines with respect to climate and soil. However, while yields of crops in Java were much the same as in the Philippines twenty years ago, today they are considerably higher. More money



Figure 9.—Textile and hat weaving.

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has been spent and greater attention given to research. Similarly, though to a less extent, Sumatra and Indochina have outdistanced the Philippines in increasing yields and improving their products. Outside the tropics to the north, Japan, with proportionately much smaller resources, affords an outstanding example of a country that has made tremendous strides in the direction of efficient production of crops.

In developing tropical products for export, the Philippines would have to compete with other oriental countries that have already given considerable attention to the improvement of such crops. Coconuts are produced in the Straits Settlements, Java, India, Borneo, and Celebes. Sugar meets outstanding competition in the Orient from Java, and is also produced in nearby Taiwan (Formosa). Sugar production is being developed in South China, and there are prospects of important development in Hainan.

Manila hemp is produced in Sumatra, timber in Borneo, rice in Indochina, and rubber in the Straits Settlements and Java. Tobacco meets competition from several quarters, a nearby example being Sumatra. Most of these competing countries have a low standard of living, and wages are even lower than in the Philippines, with little limitation on hours or requirements of labor.

As a corollary of specialization on exports to the United States, the Islands developed a dependence upon imports, and a study of their import trade shows many products, particularly those from America, that could be produced more extensively at home. The latest figures (1938) show that imports to a value of approximately 90 million pesos out of a total of 265 million pesos were of products that could be considered agricultural in origin.

With independence at hand, and a progressive decline in export preferences beginning in 1941 and terminating in 1960, the country is faced with an extensive readjustment in its economy to compensate for expected losses in the export trade, particularly in sugar and tobacco. It is not expected that other products can be found to compensate fully for these losses, and as a consequence the Philippines will be forced to reduce their imports. This can be accomplished in part by producing certain agricultural products now imported; the deficit must be further met by reducing imports of many manufactured articles which can be produced by home industry, or by small-scale manufacture.

#### CHARACTERISTICS OF PHILIPPINE AGRICULTURE

Agriculture in the Philippines is largely intensive; that is, the number of workers per unit of land cultivated is high. The natives have long tended to migrate to the plains, where rice is produced on small plots. It is now difficult for the people to move to more promising regions and break their enchainment to the land without aid and encouragement. Thus districts of congested rural population lie not far from large areas of undeveloped country, much of which is rich and fertile. One of the great problems is the redistribution of farm population. Some resettlement work is now being carried out on a moderate scale.

## REGIONAL CROP AND FARMING AREAS

The agricultural regions of the Philippines are coastal plains, upland plains, river valleys, plateaus, and slope farming areas on mountains and hillsides. Agriculture has had its greatest development on the coastal plains and more accessible river valleys and upland plains. There still remain, however, large sections of such agricultural areas that have not been developed because of the lack of transportation and of facilities for obtaining the land.



Figure 10.—Cultivation of a tobacco field.

The crops produced and the types of farming are limited by nature and by the tendency to follow customary practices of farming and living. Many of the early settlers were from rice-producing areas and naturally developed the culture of rice. Some crops were introduced into separate localities and then spread to neighboring areas, but weather and topography limit the production of others. Abacá and coconuts, which require a full season or must stand in the ground for several seasons, are confined to the localities that have rainfall throughout the year. Regions subject to heavy winds are also not favorable to tall-growing crops. Thus, because of typhoons certain tubers have become the chief crops in the Batan Islands.

Heavy cultivation of rice is found in central and western Luzon and in other regions having a distinctly dry season. Sugarcane has also developed in these

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regions, especially western Negros. Tobacco is produced in the third, or intermediate, region. Corn is produced chiefly in regions having an intermediate type of rainfall distribution.

Rice in central and western Luzon is confined to one crop annually, because of the long dry season; while on the eastern coast the more even distribution of rainfall throughout the year makes two or even three crops possible. In order to increase production of the crops that can be grown on the same land as rice, in the regions having a prolonged dry season, some type of irrigation has been found to be necessary.

The altitude is also very important in determining the types of crops that can be grown. On the coastal plains such crops as coconuts and bamboo are found; at slightly higher elevation, coffee and citrus fruits thrive. At even higher elevations, such as that of the Benguet Plateau of central Luzon, such Temperate Zone products as potatoes, oats, buckwheat, and other grains are produced. Corn and tobacco, which have a wide range of growth in both temperate and tropical regions, are found at varying altitudes. Temperate Zone trees are found in only a few of the higher points in the Islands.

The development of the highlands, which are generally suitable for the growth of citrus fruits and Temperate Zone crops, has been restricted by lack of transportation. This is now being developed. Slope farming has been followed for centuries by the natives, who have been able to make only a meager living but have continued in these areas because of lack of information about, or aid in moving to, other areas. Also, through habit many are reluctant to change from this kind of farming to the more intensive lowland type.

The most intensive type of cultivation is in the rice areas, where plots of land are small and population is very dense. Corn is also produced on small plots in areas of dense population, as in Cebu. In a few instances rice is cultivated in large holdings as a unit, but this is usually not practiced owing to systems of holding and renting land. There are also some large coconut plantations where cultivation and harvesting are carried out under one management through improved methods of cropping and use of machinery.

The development of systems of agriculture has also been much affected by available markets and transportation; an illustration is the development of tobacco in the Cagayan Valley of Luzon and livestock on the Bukidnon Plateau of central Mindanao.

The raising of sugarcane in certain areas was due not only to available soil and suitable climate but also to convenient transportation and an abundant labor supply. Availability of work animals at times has had an important effect, particularly upon the production of rice. Cotton is well adapted to several different, widely separate sections. Production expanded to a certain extent to take care of local needs for cotton cloth but afterwards declined, owing to the development of more profitable substitute crops.



Figure 11.—A harvest scene.

## TRENDS IN PRODUCTION

**Crops:** The areas planted to the principal crops have shown a steady increase during the past 30 years, with rice occupying approximately 50 percent of the total. The other leading crops in order of importance are coconuts, corn, abacá, sugarcane, and tobacco. The acreage of corn showed a moderate rise until 1920 but has shown little change since. The coconut area has shown a rather steady moderate upward trend. The area under sugarcane rose, with some fluctuations, from 205,093 acres in 1910 to 756,126 in 1934, but has since declined to 635,047 acres. From 1910 to 1937 the changes in percentage of the total represented by the principal crops have been as follows:

|                 | 1910<br>Percent | 1937<br>Percent |
|-----------------|-----------------|-----------------|
| Rice .....      | 52.63           | 48.75           |
| Coconuts .....  | 7.25            | 15.04           |
| Corn .....      | 12.73           | 15.60           |
| Abacá .....     | 20.98           | 11.89           |
| Sugarcane ..... | 3.67            | 6.08            |
| Tobacco .....   | 2.37            | 1.75            |

During this time the total area in these principal crops, including maguey, increased from 5,597,161 acres to 10,447,289 acres.

During the past 30 years the yields of some important crops have increased substantially, while others have declined. Most are still low compared with the improved yields in other countries. The changes in yield per acre from 1910 to 1937 were as follows:

|                           | 1910<br>Pounds | 1937<br>Pounds |
|---------------------------|----------------|----------------|
| Rice .....                | 1,534          | 2,588          |
| Coconuts (per tree) ..... | 88             | 73             |
| Corn.....                 | 1,093          | 1,501          |
| Abacá .....               | 1,027          | 1,067          |
| Sugarcane .....           | 3,968          | 9,259          |
| Tobacco .....             | 1,151          | 992            |

In connection with the necessary changes in trade between the Philippines and the United States, there will be a decline in the production of tobacco and sugarcane, and an increased output of those agricultural products now imported. There will also be general increases necessitated by improvement in diet and the natural increase in population. Substantial increases in area and in yield are projected for rice, corn, and various other food crops, as well as certain textile and oil-producing crops. The present area in important crops is expected to be expanded from some 15,567,000 acres to approximately 18,285,000 acres out of a total available cultivable area of 44 million acres.

The main objectives of the program of economic adjustment are (1) to furnish an adequate supply of food staples (chiefly rice and corn) and the additional foods required to maintain a healthful diet; (2) to produce some of the food products and raw materials, such as cotton, now imported in the form of manufactured products; and (3) to develop certain products for export, such as oils, medicinal products, fibers, and possibly tropical fruits.

To increase the production of the meat, poultry, and dairy produce now imported, increased production of corn and forage is being encouraged.



Figure 12.—Cart of corn.

A few major export crops have been concentrated on a large part of the total acreage. The resulting purchasing power has brought imported goods. Some of these products have been imported because it was cheaper to obtain them from abroad than to transport them from surplus to deficit areas within the Philippines. Rice acreage gave way in part to sugar shortly after the occupation by the United States; and, following the earlier shift from rice and cotton in parts of Luzon to tobacco, the tobacco acreage

gave way in part to sugar, owing to surplus production of tobacco. Coconuts increased, principally on new land, part of which might otherwise have been devoted to rice.



Figure 13.—Philippine carabao crossed with Burma water buffalo. These animals are worth about three times either of their parents as work animals.

*Trend in livestock:* Statistics for the last 30 years indicate a definite upward trend until 1930 in the production of carabao, cattle, horses and mules, sheep, and swine. Since that date numbers have declined. Goats showed an important increase until 1925, but have since declined substantially. Poultry has shown a steady rise.

TABLE 2.—Livestock numbers in the Philippines, 1936 with comparisons

| YEAR         | CARABAOS    | CATTLE      | HORSES<br>AND MULES | SHEEP       | GOATS       | SWINE       | POULTRY <sup>1</sup> |
|--------------|-------------|-------------|---------------------|-------------|-------------|-------------|----------------------|
| Average:     | :Thousands: | :Thousands: | :Thousands:         | :Thousands: | :Thousands: | :Thousands: | :Thousands           |
| 1910-1914 .. | 924         | 353         | 168                 | 90          | 492         | 1,881       | 9,445                |
| 1915-1919 .. | 1,290       | 597         | 226                 | 152         | 700         | 2,828       | 11,384               |
| 1920-1924 .. | 1,565       | 827         | 281                 | 259         | 1,022       | 5,760       | 13,324               |
| 1925-1929 .. | 1,858       | 1,052       | 319                 | 266         | 953         | 6,563       | 15,244               |
| 1930-1934 .. | 2,169       | 1,324       | 349                 | 124         | 445         | 2,697       | 17,204               |
| 1936 .....   | 2,301       | 1,535       | 420                 | 151         | 540         | 3,126       | -                    |
|              | :           | :           | :                   | :           | :           | :           | :                    |

<sup>1</sup> Calculated from figures given in the Census Reports of 1903 and 1918.

Philippine Research Council Reports, 1937.

A general program for livestock contemplates the production insofar as possible of the meats now imported and of a more adequate supply of work animals. No estimates

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have been made of the probable increase during the next 15 or 20 years, which will depend upon research now in progress to produce animals adapted to Philippine conditions and the working out of rations that can be produced to advantage locally. Disease control will continue to demand attention as a prerequisite to any large-scale increases in livestock. The fact that there has been a decline in the numbers of sheep and swine during recent periods indicates that the balance of production under existing conditions has been exceeded. This is believed to have been due to the lack of improved types and efficient methods of feeding and livestock management.

#### AGRICULTURAL PROBLEMS AND DEVELOPMENT OF POLICIES

While modern agriculture in the Philippines has been built up around the production of a few export crops, chiefly sugar, rice culture has always been of first importance in supplying food, and about one-half of the cultivated land has been devoted to rice. The crop is not consistently large enough to supply domestic needs, and important quantities have had to be imported from time to time. A large variety of fruits is produced, but fruit growing is widely scattered. Quantities produced are not sufficient to make fruit readily available to large masses of the population as a supplement to their diet. The congestion of population - particularly in the rice section, despite the fact that there are large undeveloped areas with fertile land available - makes necessary an extensive resettlement program.

The chief efforts of agricultural administration during the past, partly because of limited means, have had to deal with animal disease and insect-pest control and the introduction and improvement of certain crops. Livestock breeding has also been given some attention. Features of government work that deserve more attention are the proper use of land, improved conditions of land tenancy, better systems of farm organization and marketing methods, and improved credit facilities. A more diversified production of crops is needed to provide a more balanced diet and to make possible the exchange of products grown in different parts of the country. A study of reduction in the cost of production is also necessary in the case of export crops competing in the world market. With the elimination of trade preferences under the Independence Act, the Islands are faced with a formidable problem of crop adjustment. Probably much of the sugar land and some of the tobacco land must be converted to other uses. Coconuts and abacá will also be affected to a lesser extent. The area of some 741,000 acres is not large, but the question of finding profitable crops to substitute thereon is serious.

This problem of crop adjustment greatly affects the economy of the country as a whole, since purchasing power has depended to such a large extent upon the exports of certain crops having preferential treatment in the United States. If the exports of these products are greatly reduced, as is expected, through the decline of preferences under the Independence Act, new markets must be found for Philippine exports, new products found to export, and present imports must be reduced considerably. The problem in its broader aspects, therefore, is one of maintaining the purchasing power of the Philippines for desired imports. Since agriculture is the basic industry, it will be called upon to supply the necessary purchasing power.

A large proportion of the food and certain other imported products could be produced in the Philippines. Agriculturists and economists are beginning to address themselves to this problem. So far little progress has been made toward improvement of efficiency in order to compete on unprotected export markets and so to maintain a part of the current exports of some products and to increase the exports of others. There will be difficulty in financing the economic adjustment necessary after the removal of trade preferences in the United States, since a substantial amount of the current revenue is derived from the domestic products receiving preferential treatment in the United States. The urgency of adjusting agriculture while the returns from the excise taxes are still available is apparent. Such adjustments may offset losses in exports and provide the purchasing power needed to improve the comparatively low standard of living of the masses.

Agricultural adjustment through the expansion of existing agencies must be supplemented by improvements in health, literacy, and in means of communication. The problem of redistributing the population is complicated by social as well as economic factors; there are several diverse groups of population in the Islands, many of which are quite foreign to one another. To remove these people to new regions and provide the means for their independent development and for a higher standard of living is a problem of tremendous scope. The problem is not impossible to solve with the means at hand, but it will require the active and coordinated efforts of public agencies along many fronts.

Abundant agricultural resources seem to exist. If the economic problems of proper land use and development are worked out and facilities are provided for movement of the population to the more productive areas and for supplying the necessary information to farmers in general with regard to plant and animal propagation, the cost of production can be lowered, a better standard of living attained, and a surplus of sufficiently low-cost crops produced to meet the demands of the export market. Wages of labor may have to be lowered to compete with other oriental countries, but this may be offset by the reduced cost of living through cheaper production and better distribution.

To increase the income of farmers and supply them with manufactured products, it is planned to promote home industries and certain manufacturing industries for the better utilization of the Philippine animal and plant raw materials.

#### IRRIGATION

Irrigation is very important in the Philippines. By irrigation, minor crops may be cultivated during the dry season as important items increasing production and improving the income of farmers. Most irrigation systems, ancient and modern, have been planned for the purpose of irrigating ricelands. Since ancient times systems of irrigation have been built to furnish water to rice fields. The most extensive systems of irrigation were constructed by mountain tribes, who built the famous terraces of the mountain provinces. It is only during recent years that the irrigation of sugarcane has been found profitable.



Figure 14.-Rice terraces of the mountain provinces.

The construction of extensive dams for the control and diversion of streams was undertaken by the friar estates, mostly of Cavite Province. In 1907 under the American regime, studies and surveys were begun for the construction of irrigation systems, for which an appropriation of 250,000 pesos (\$125,000) was voted as a reimbursable fund.

In 1922 the Philippine Legislature authorized the issuance of bonds in the amount of 20 million pesos for irrigation. Since then systems have been established in 11 provinces with a total cost of construction of 17 million pesos and an irrigated area of 185,325 acres. There are irrigation systems operated by other than governmental agencies in 7 provinces, involving a cost of 1,274,000 pesos and servicing an area of 19,583 acres.

The construction of irrigation systems has made slow progress, owing to the difficulty of collecting charges, to complaints of unsatisfactory services, and to the low price of rice, which offered no inducement to incur the added expense. The plan to build several additional systems was therefore recently abandoned.

It was originally intended to charge costs of construction against the total area irrigated; payment was to be made in 40 years, plus an interest charge of 4 percent. Under this plan landowners were to become the owners of the irrigation system, after completing the payments. This plan has suffered several successive changes. At present it is contemplated that payment shall be made indefinitely and that the system shall thus remain government property and enterprise.

Lately there have been renewed efforts through legislation to lower the charges from 12 to 6 pesos per hectare per year (about \$1.20 per acre). This rate, it was stated in the 1934 report of the Philippine Economic Association, would not be

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sufficient to recover the cost of construction and would barely cover maintenance and operation. Development is not active at present, owing to difficulties in cropping plans (principally the production of rice) and in the working out of a feasible method of charges.

With the proper application of irrigation to the rice areas in the Philippines, the cultivation of minor crops during the dry season could be developed, thus bringing increased income to farmers.

#### LAND TENURE

Tenancy in the Islands dates back to Malay occupation. These early immigrants arrived in large swift boats, or *baranquays*, and settled under the leadership of headmen, or *datos*, who gave out parcels of land to their followers. Thus a feudal system was instituted, which laid the foundation for many of the practices that are still followed today.

The Spaniards instituted the *encomienda* system, which had its beginning in Mexico, by which country the Islands were ruled for a time. The Spanish governor gave large grants of land to Spanish citizens of the Islands, and the natives living in the villages went with the land. The leaders, or *encomenderos*, were supposed to take care of the inhabitants, who in turn were obliged to pay an annual tribute.<sup>9</sup> The manorial system did not effect a complete peonage in the Islands because of the resistance encountered and the outbreaks of frequent revolts.

Another element in the development of landholding was the rise of large Spanish friar estates. Friars were instrumental in overthrowing the *encomienda* system, or holding it down to a tax-collecting mechanism. They discouraged any form of secular control of agriculture, or even travel into outlying districts.<sup>10</sup> The power of the friars became very great, and their estates increased rapidly.

At the inauguration of the American Civil Government, friar estates comprised 425,000 acres of land, a large part of which was later purchased from the proceeds of a loan authorized by the United States under Act of Congress and issued by the Insular Government of the Philippines. It was hoped that this purchase would alleviate some of the worst features of tenancy in the Philippines, but according to investigation the reparceling has not brought about the improvements expected. A large percentage of the parcels are still held under tenancy and the lot of the tenants now on the land is no better than before.<sup>11</sup>

The census of 1918 indicated the paradox of increasing tenancy in a country having large areas of uncultivated fertile land. The census of 1933 was not expected to show an improvement in the situation.

<sup>9</sup> Hester, Evett D., and Mabbin, Pablo, *Some Economic and Social Aspects of Philippine Rice Tenancies*, 1924.

<sup>10</sup> *Ibid.*

<sup>11</sup> *Ibid.*

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Most of the free holdings are very small in area. On the other hand, a considerable portion of the land is held by large landowners renting to a number of different farmers and tenants.

Probably nine-tenths of the land in the Philippines is cultivated by peasant proprietors, on shares. Hired labor is used on most of the remaining tenth. The amount of land rented outright is small.

Under the proprietary system, the owner of a large estate superintends affairs directly or through managers, and the laborers work for a wage under the direction of foremen. This system is often followed on the sugar plantations of Occidental Negros.

Peasant-proprietor holdings are small, and in the newer regions usually vary from 2 to 12 acres. In the well-settled regions holdings are generally smaller. Investigations have shown that annual incomes average about 250 pesos (\$125) and are seldom derived wholly from agriculture.

The *kasama* share system followed in the heavy rice-growing section of Luzon is the most common form of this system of tenancy.<sup>12</sup> Under the system the owner furnishes the carabao (as work animal) and the seed, and the crop is equally divided after deducting the cost of the seed. The tenant may draw various advances, including rice, which must be paid back at prices lower than those prevailing on the market. The tenant is usually heavily indebted to the landlord, and his standard of living is very low.

Another form of the share system is that of the *hacienda*. The amount of land leased varies with the crop and locality but is usually from 2 to 5 acres. For sugar and abacá the amount is larger than for tobacco and rice. The division is usually based on a valuation of one-third for labor (tenant), one-third for landlord, and one-third for working capital. A house plot in the village either goes with the leasehold or is rented for a small sum.

The rights and duties of tenants differ in different parts of the Islands. In general, the landlord is paternalistic. In some places he requires extra work, which may be compensated for by gifts or fiestas. The tenant looks to the landlord for advice in all important matters and usually continues in his debt. It is therefore difficult for the tenant to leave the land. If the land is sold, the rights in the debt are sold with it. When the tenant dies, his children usually assume the debt.

The land may also be divided into small holdings, widely scattered but under one ownership. The division of the crop is about the same as under the *kasama* system, but the general condition of the tenant is better.

Under the interleasing system, the owners lease their more distant parcels and in turn become tenants on more conveniently situated land.

<sup>12</sup> Miller, Hugo H., *Economic Conditions in the Philippines*, 1920.

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#### LAND RESETTLEMENT

Although there has been a homestead land policy for a number of years, the public domain has been little settled, because of the lack of initiative and of financial resources of peasants and laborers.

The government has now undertaken a new project in land resettlement in Mindanao, involving an aggregate of 404,200 acres. This is financed and controlled by the government, in contrast with former projects in which only transportation and a little cash were advanced. Sites have been carefully selected and the essential utilities provided. Assistance will also be given in the marketing of products and in obtaining the necessities of life, so that the farmers will not fall into debt to middlemen.

Through a workable cooperative plan, the new settlers, who are carefully selected according to merit and agricultural background, will be given guidance and financial support and an opportunity to build an economic future through individual effort. It is planned that new cash crops will be produced on this project to replace some that must now be reduced, because of losses expected in exports. Rubber and cotton are to be tried. Every settler is to be allowed a loan of 1,200 pesos (\$600), which will be given in kind from time to time as the development of his farm requires. The loan runs 20 years at 4-percent interest.

In each of the town sites will be space for public buildings, including a hospital. Health facilities will be especially provided for. Each family is allowed about half an acre in the town site and a house of an approved type, not to exceed \$100 in cost. In addition to the house, every family will be given 29.65 acres of land, on which rubber and cotton must be raised on at least half the area. The remainder will be planted to subsistence crops, such as rice, corn, and fruits, with some pasture for work animals.

In addition to relieving the pressure on congested areas by means of a land-resettlement program, the Philippine Government could further alleviate the present tenancy situation by improvement of lease contracts, by offering credit at lower rates of interest, and by providing opportunities for the profitable utilization of labor throughout the year. Some expansion in educational opportunities and in public health work is also needed.

#### MAINTENANCE OF SOIL FERTILITY

The maintenance of soil fertility is important to the program of producing crops best adapted to the market and of adjusting production in line with future trade requirements. Yields of important crops in the Philippines are low compared with those in other countries. This is not because of a basic lack of fertility, but because soil-conservation measures by the government and improved farm practices of cultivation and fertilization have not kept pace with such developments in similar tropical areas.

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The problem of soil fertility has recently forced itself upon the government, because of the decreasing yields of certain crops and the importance of readjusting the whole agricultural industry to the economic requirements of the country as an independent nation.

In this tropical country with periods of extremely heavy rainfall, soil erosion is pronounced in some places. This problem has been accentuated by the lack of proper methods for the conservation of the upper layer of the soil against excessive washing. This problem of erosion necessitates the terracing of hilly and mountainous areas.

The *caingin* system (a system of temporary clearing of land), practiced in many parts of the Islands, has caused deterioration of and considerable loss of fertility in large areas. Under this system trees and shrubs are cut down and burned, leaving the land surface bare. After continuous cultivation of this land without the use of cover crops, heavy rains wash the surface soil badly, especially on slopes. In many places hilly and mountainous slopes should not have been farmed, for yields have declined rapidly and erosion has progressed to such an extent that it would not pay to recover the land for farming purposes. In many places, therefore, as in parts of the island of Cebu, it is considered more economical to move the occupants to more fertile undeveloped country.

Soil specialists have recommended that all land subject to erosion should be planted to permanent crops, or terraced. In places where cover cropping and terracing do not warrant the expense involved, reforestation should be instituted.

It has been found that Philippine soils, largely as a result of continuous cropping, leaching, and erosion, are deficient in nitrogen and, to a less extent, in phosphorus and potassium. Possibly the soils found in Saray-Ajuy, Iloilo Province, Panay, are the most drastically depleted in the Philippines. This district, one of the oldest sugarcane sections, is rolling and conducive to erosion. The land has been under cultivation for many years, and no provision has been made to replace the elements lost by leaching and erosion.

Table 3 shows data on the extent of erosion and land subject to erosion in certain important provinces of southwestern Luzon:

TABLE 3.—*Extent of eroded land and land subject to erosion, in important southwestern provinces of Luzon*

| PROVINCE       | TOTAL AREA | ERODED AND EROSION AREA | PERCENTAGE OF ERODED AND EROSION LAND |
|----------------|------------|-------------------------|---------------------------------------|
| :              | :          | :                       | :                                     |
| :              | Acres      | Acres                   | Percent                               |
| Bulacan .....  | 644,437    | 252,361                 | 39.10                                 |
| Rizal .....    | 575,533    | 264,424                 | 45.90                                 |
| Cavite .....   | 296,955    | 191,246                 | 64.10                                 |
| Batangas ..... | 803,495    | 588,372                 | 73.20                                 |
| :              | :          | :                       | :                                     |

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The high percentage of eroded and erosive land in these important provinces shows the tremendous importance of the problem of soil conservation in the Philippines.

A soil-survey project has been sponsored by the Philippine Department of Agriculture and Commerce through the Bureau of Science. The soil has been surveyed and mapped in some of the more important provinces on a reconnaissance basis. Recently this project was enlarged, and it is now planned to complete the reconnaissance survey and follow it with detailed surveys within 5 years, in order to procure data of sufficient value to serve as a basis for plans for agricultural development and farm organization. This will be undertaken with the cooperation of the Philippine Bureau of Plant Industry, which will undertake the agronomic aspects of the study. The Bureau of Forestry will cooperate in the study of the forest areas. Other bureaus, such as the Bureau of Lands, the Bureau of Mines, and the Weather Bureau, will be of assistance in the application of the soil data to different economic uses.

In addition to the actual soil-survey work, the soil-survey project includes the conducting of field experiments in different provinces to determine the fertilizer requirements of the various important crops grown in the locality. With the information available from the soil survey and from systematic experiments, farm extension workers will be able to advise regarding the best crops to produce and the best methods of farming to increase yields to the desired level.

Results with fertilizers in different parts of the Islands, particularly when used for rice and sugarcane, have shown that yields can be materially increased through the application of fertilizer. Successful results are reported from sugar areas of Iloilo, Laguna, Pampanga, and Tarlac Provinces through the application of various nitrogen, potash, and phosphoric acid fertilizers, particularly nitrogen. In experiments on rice at Munoz, it was found that yields could be increased by 583 bushels over those on unfertilized areas. Experiments on rice with ammonium sulphate fertilizer by the Bureau of Plant Industry showed conclusive gains with applications of 220, 275 and 330 pounds per acre, varying with amounts of the fertilizer applied, although the 330-pound rate was most economical. The use of other fertilizers, such as manure, copra cake, bone meal, and superphosphate, also resulted in significant gains. Liming has been found beneficial on acid soils in Pangasinan Province, Luzon.

#### FARM LABOR

An extra supply of seasonal labor is required, especially in the sugar, coconut, and abacá industries. In the poorer and more densely populated sections of the country there is a surplus. Migratory workers from these surplus areas move from place to place according to seasonal demand; some go into industrial centers and some to more sparsely populated sections, such as Mindanao, where there is new land to be developed.

The lack of seasonal labor in certain sections where it is needed is due partly to the distance between the deficit and surplus areas and partly to the lack

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of transportation and systematic recruiting. Formerly large numbers of Filipino laborers emigrated to Hawaii each year. In 1930 110,000 are estimated to have emigrated. There is, therefore, probably no great lack of labor in the Islands if it could be properly recruited. Under the Independence Act, Filipino laborers are no longer allowed to emigrate to Hawaii, except in certain cases and upon recommendation of the Secretary of Interior of the United States, in accordance with demand for labor in Hawaii. Since the labor supply is such an important resource, the comments of the Philippine Bureau of Commerce and Industry are worthy of note.<sup>13</sup> The Bureau states that the Filipino laborer is intelligent, industrious, painstaking, and accurate in executing orders; moreover, he is a loyal laborer, and physically strong and efficient in handling machinery. His principal shortcomings are his rather low power of resistance to disease - probably because of the climate and his poor diet - his lack of thrift, and of pioneer spirit. He works well under close supervision, but is often inclined to be indolent otherwise.

Table 4 shows the distribution of population and of farm labor in the Philippines. It indicates that some redistribution to encourage the settlement of the labor surplus in undeveloped sections would be advantageous. Despite an important amount of surplus labor, there is evidence of deficiency in certain localities, and large amounts of extra-seasonal help are needed. Better regulation of the available labor supply and its more efficient use are necessary.

Large numbers of itinerant laborers move each year from the Ilocos Provinces of northwestern Luzon to the central plain for rice harvesting, some of whom settle in those sections or in the Cagayan Valley. Laborers from Panay and Cebu go to Occidental Negros during the sugar planting and milling seasons. The coconut growers of Laguna and Tayabas Provinces obtain their additional workmen from the more thickly populated provinces of central and northern Luzon. Recently much of the surplus population from the overcrowded sections of Cebu, Bohol, and Panay has settled in Mindanao. Smaller numbers have also moved to the undeveloped sections from central and southern Luzon and the Ilocos provinces.

Recent data on the labor population of the Philippines<sup>14</sup> show that, of a total of 2,857,401, agricultural laborers made up 254,572. The census of 1913 indicated that 227,615 were engaged in household industries. Although it is not indicated, there may have been some overlapping in the classifications, and some of these may have been engaged part time in agricultural work.

Early in the American occupation, because of various labor troubles that had occurred some time ago, it was believed that a sufficient supply of labor did not exist, and Chinese coolie labor was admitted. Soon, however, legislation excluded such labor. The Chinese and Japanese labor in the Islands today is not competitive to an important extent with native agricultural labor, but is engaged largely in commercial and industrial activities.

<sup>13</sup> *Commercial Handbook of the Philippine Islands, 1924.*

<sup>14</sup> *Philippine Economic Association Report, 1934.*

TABLE 4.—*Distribution of population and agricultural labor in the Philippines, by provinces*<sup>1</sup>

NAMES OF PROVINCES	AREA IN SQUARE MILES	NUMBER AGRICULTURAL LABORERS	NUMBER AGRICULTURAL LABORERS PER SQUARE MILE	POPULATION PER SQUARE MILE
Abra . . . . .	1,475	34,952	23	68
Agusan . . . . .	4,294	18,863	4	12
Albay . . . . .	1,543	68,949	44	252
Antique . . . . .	1,011	22,804	22	190
Bataan . . . . .	480	15,260	31	142
: . . . .	:	:	:	:
Batanes . . . . .	74	3,577	48	179
Batangas . . . . .	1,270	123,241	97	231
Bohol . . . . .	1,536	96,073	61	294
Bukidnon . . . . .	3,871	7,008	2	13
Bulacan . . . . .	1,007	66,885	66	281
: . . . .	:	:	:	:
Cagayan . . . . .	3,007	67,359	22	81
Camarines Norte . . . . .	779	5,540	7	96
Camarines Sur . . . . .	2,072	57,533	28	130
Capiz . . . . .	1,710	48,086	28	199
Cavite . . . . .	464	39,490	85	396
: . . . .	:	:	:	:
Cebu . . . . .	1,867	248,434	133	560
Cotabato . . . . .	9,620	32,452	3	19
Davao . . . . .	7,486	12,866	2	16
Ilocos Norte . . . . .	1,293	87,376	67	204
Ilocos Sur . . . . .	442	96,575	218	581
: . . . .	:	:	:	:
Iloilo . . . . .	2,040	128,893	63	297
Isabela . . . . .	4,052	63,352	15	37
Laguna . . . . .	722	53,794	75	316
Lanao . . . . .	2,439	30,000	12	39
La Union . . . . .	350	51,123	146	588
: . . . .	:	:	:	:
Leyte . . . . .	3,005	38,141	46	237
Marinduque . . . . .	356	10,868	31	255
Masbate . . . . .	1,545	5,160	3	69
Mindoro . . . . .	3,928	13,200	3	24
Misamis . . . . .	1,030	70,059	68	250
: . . . .	:	:	:	:
Mountain Province . . . . .	6,447	65,872	11	41
Negros Occidental . . . . .	3,125	62,930	20	144
Negros Oriental . . . . .	1,902	72,850	38	168
Nueva Ecija . . . . .	2,069	110,424	53	125
Nueva Vizcaya . . . . .	3,530	31,000	9	11
: . . . .	:	:	:	:
Palawan . . . . .	5,619	23,081	4	13
Pampanga . . . . .	823	51,568	72	379
Pangasinan . . . . .	1,944	200,678	103	352
Rizal . . . . .	899	16,596	19	290
Romblon . . . . .	505	12,037	24	171
: . . . .	:	:	:	:
Samar . . . . .	5,234	116,093	22	111
Sorsogon . . . . .	729	35,722	49	282
Sulu . . . . .	1,082	10,700	12	39
Surigao . . . . .	2,889	47,926	17	49
Tarlac . . . . .	1,178	51,568	43	194
: . . . .	:	:	:	:
Tayabas . . . . .	3,839	70,580	18	67
Zambales . . . . .	1,421	19,465	13	77
Zamboanga . . . . .	6,383	12,805	2	27
: . . . .	:	:	:	:

<sup>1</sup> From *Introduction to Agricultural Economics in the Philippines*, Dimas Maulit, Bureau of Education, Manila, 1936, p. 41.

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The recently expanded program of public works is being designed, so far as possible, to make use of the extra supply of labor during the off season.

There are numerous labor organizations, among them the National Federation of Tenants and Farm Laborers. In many cases strikes and general labor movements have been conducted or supervised by these organizations. There have been many labor disputes arising out of the tenancy system, which have lately caused much trouble and have given reason for serious consideration by the government to the working out of the problems involved. During recent years there has been much labor legislation relative to wage scales, hours, regulation of tenancy, and creation of a position of Inspector General of Labor in the Department of Labor. In places a minimum wage has been set and a court of arbitration for labor disputes has been established.

The income of tenants and peasant proprietors is severely limited by small farm units and by lack of animals and implements. According to one investigator,<sup>15</sup> these handicaps in general do not permit the tenant and peasant proprietor to put in more than about 200 hours of labor per annum per acre on his holding. Later surveys indicated that this estimate was far too high, and 790 Philippine rice stations gave an average of 121 hours per acre. These surveys indicate the importance of population redistribution and improved farm management and credit facilities.

#### CREDIT

Facilities for agricultural credit fall far short of the need. Several attempts have been made to improve credit through legislation, but a thoroughgoing study is needed, with improvement in the organization and direction of credit agencies, and more extensive education in farm credit for those using it and administering it. Problems of adequate credit are more concerned with arrangements for administration and direction of the use of credit than with the lack of appropriations for granting credit. The proper expansion of agricultural credit will depend upon the ability to use such credit efficiently in improving production and marketing. Improvement in methods of storing crops will also show the way to increasing and improving the use of farm credit.

The rural credit law passed in 1915<sup>16</sup> was organized under the rural credit section of the Bureau of Agriculture and later transferred to the Bureau of Commerce. Under the above-mentioned act no fewer than 581 agricultural-credit cooperative associations were organized. These associations have met many difficulties through lack of familiarity by administrators or members of the boards of directors with the provisions of the law, and because of insufficient experience in and knowledge of the uses of agricultural credit. As the members of these associations in the provinces were farmers, it has naturally been difficult to find men with the necessary training and experience to run the associations on a modern and efficient basis. Lack of

<sup>15</sup> Hester, Evett D. and Mabbun, Pablo, *op. cit.*

<sup>16</sup> No. 2508.

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compensation for those chosen to manage the association has also caused a lack of interest. It has been difficult to collect many of the loans, and in some instances the borrowers themselves are on the board of directors.

One authority<sup>17</sup> found a fundamental difficulty to be in the power of the board of directors to approve or disapprove all applications for loans, with the result that most of the loans have been granted to relatives or friends. It was further noted that many loans are not made specifically for agriculture, as the law directed. Authorities ascribe the failure of many associations in Panay to the attitude of the people toward their government managing associations, in that they did not have a sense of personal responsibility in maintaining the capital of the associations.

It is now recognized that trained government personnel is needed to supervise credit associations frequently and thoroughly in order to make them successful, and that government agents should spend some time in teaching the principles of rural credit to individuals applying for loans. It has also been recommended that loan facilities be extended to enterprises supplementary to agriculture, such as commerce, fishing, and weaving.

Agricultural credit is now available through several different agencies. Rural credit associations have been granting agricultural loans since 1916. The Philippine National Bank and other banks grant agricultural loans of varying terms at interest ranging from 6 to 10 percent. The government grants financial assistance to agriculture through the Rice and Corn Fund inaugurated in 1919, and through the Agricultural Cooperative Fund established in 1936. The sugar centrals and sugar exporters grant various forms of agricultural loans. The Farmers' Loan, Inc., is a recognized agency for granting loans. Unauthorized loans are made by Chinese merchants and various other individuals. Farmers are often forced to borrow money from landlords and stores at usurious rates of interest.

The Philippine National Bank has endeavored to organize rural credit associations in different districts of the archipelago, but it was able to establish only six because of the modest capital requirements. Of these six associations two later asked for dissolution because of the inability of the entire membership to comply further with their subscription pledges. It is said that lack of success in forming these associations is due partly to disappointment of the people over the failure of many of the agricultural credit cooperative associations organized by the Bureau of Agriculture.

The recently established organization of rural banks under the supervision of the Philippine National Bank is a further attempt to make more capital available for local agricultural uses. Some of these banks are believed to have obtained comparatively satisfactory results, but more local support is hoped for to enable them to extend their operations. For six rural banks established the authorized capital is only 300,000 pesos (\$150,000), and the paid-up capital 142,260 pesos (\$71,130); only three are in active operation.

<sup>17</sup> Arnaldo, M. V. *Summary of the Situation of the Agricultural Credit Co-operative Associations in the Island of Panay, 1931.*

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#### AGRICULTURAL ASSOCIATIONS

In addition to the cooperative marketing associations and the rural credit associations mentioned in the previous section, there are certain other associations for the promotion of agriculture. Among these are the National Rice Growers' Association, the Coconut Planters' Association, the Livestock Marketing Association, and the Philippine Sugar Association. There are also various associations of sugar planters.

The purpose of the Coconut Planters' Association is to protect the interests of those engaged in the production of coconuts and copra or in the manufacture of their byproducts. It is also engaged in the improvement of marketing and production and the establishment of better credit facilities for the coconut planters and copra producers.

The objectives of the National Rice Growers' Association are similar to those of the Coconut Planters' Association. In addition, an important feature of their program is the encouragement of planting of profitable intermediate crops during the dry season and the establishment of a better balance between production in surplus and deficit areas. The Association is also working toward improvement of rice marketing.

The chief aim of the Sugar Planters' Association is to improve methods of production and protect the interests of the planters in the marketing of their product. The Association is composed of owners of sugar refineries, planters having milling contracts with members of centrifugal sugar centrals, and any individuals who are directly interested in the production of centrifugal sugar. Their purpose is the improvement and protection of the sugar industry of the Philippines, the regulation and distribution of the labor supply, and the introduction of advanced methods in the manufacture of sugar.

#### FISCAL POLICY

The revenue from taxation represents about 70 percent of the total revenue of the Insular Government. Incidental revenue is derived from such items as forest products and the sale of public domain. The third classification includes earnings and fees collected by the government. At the present time, large amounts of revenue also accrue to the Philippine Treasury from excise taxes levied in the United States on Philippine products and returned to the Insular Government. These funds, however, are set aside for the specific purpose of economic adjustment.

Under existing legislation the taxing power of the Insular Government is very broad, the provincial and municipal governments exercising a very limited power in this respect.<sup>18</sup> It was believed by the Philippine Economic Association that it was best to postpone any fundamental changes in the present tax legislation until

<sup>18</sup> Philippine Economic Association, *Economic Problems of the Philippines*, 1924.

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the effect of the new government on economic activities was known. It was thought that they would then be able to determine new sources of revenue, take up the abolition of certain taxes, or consider increases or decreases in existing tax rates as conditions warranted.

The provinces and municipalities also derive the greater part of their income from taxation, but their taxing power is limited. Besides the proceeds of various fees and license taxes, the provincial and municipal governments receive 40 percent of the internal revenue accruing to the Insular Government, provided that the amount is not in excess of the allotment of 1909.

Because of limitation of the internal revenue allotments to the 1909 figures, there have been attempts to amend existing laws. One proposal is to eliminate the limitation and base the allotment on population at the present time. Another would base it upon collections made in the jurisdiction, but this would give Manila 75 percent of the revenues.

The present tax burden in the Philippines is not high, but distribution could be measurably improved. A suggestion of the Joint Preparatory Committee for Philippine Affairs was that a special tax might be considered to discourage the practice of distributing farm land into plots too small to meet the requirements of operators.

Since the beginning of American administration in the Philippines, the government has been self-supporting with the aid of certain taxes on Philippine products collected in the United States and returned to the Philippines. One of the largest items in the budgets of modern governments, however, that for defense, has been largely assumed by the United States. During this period improvements were made in the Islands in the nature of public works and schools. Much, however, remains to be done in the way of improving natural resources, especially agricultural, to insure the future stability of the country's economy.

At the present time the indebtedness of the Islands is relatively small, and the currency is in sound condition. The Government, however, is facing extensive expenditures to meet the needs of economic adjustments incident to acquiring independence in 1946. In addition, the requirements of the new army will be an important item. Expenditures for the necessary economic adjustments are to be made from proceeds of the excise tax on Philippine products in the United States, but these funds are not to replace revenues for present budget items. The new expenditures, including those for certain public works, for expansion in agricultural research and extension work, for improvement in forestry administration and fisheries, and for improved facilities for education and health, will total several times the present budget.

#### CURRENCY

The act of March 2, 1903, (32 Stat. 952), established the Philippine monetary system on a gold-exchange standard with a legal ratio of 2 Philippine pesos to 1

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United States dollar. The changes in the United States monetary system of 1934 made it necessary for the Philippines, without changing the aforesaid ratio, to adopt the dollar-exchange standard. It is expected that this will be maintained, at least during the Commonwealth period, in order not to disturb the fiscal arrangements between the Philippines and the United States. The Philippine Government has unusually large currency reserves on deposit with the Treasury of the United States for the period of the Commonwealth. When final settlement is made regarding Philippine bonded indebtedness to Philippine monetary reserves, this fund is to be turned over to the independent Government. If this is done, it will supply material assistance during the early years of the independence period, when the most difficult financial problems will have to be solved.

#### AGRICULTURAL EDUCATION AND ORGANIZATION

An extension of the program of primary and agricultural education is necessary to enable any considerable number of farmers to grasp the scientific information necessary to increase crop yields and to improve livestock. A large percentage of the rural population is still illiterate. Little or no agricultural information is conveyed to the rural population through the local schools, and elementary education is needed to enable the farmers to read simple agricultural literature and advice from extension agents. A program is now under way to extend the school system, but at present progress is slow because of the inability of many districts to raise sufficient revenue. The National Economic Commission has recommended that appropriations be made for the establishment in every province of agricultural high schools.

A program has been prepared by the Bureau of Education for increasing the number of vocational agricultural high schools, involving the conversion of present agricultural high schools into those of the Munoz type. The Munoz school has been very successful in teaching the students actual farming and enabling them to pay for their schooling by operating land connected with the school while obtaining their agricultural education.

The agricultural college at Los Baños has been in operation since 1907 and furnishes a good standard of agricultural training. The aim of the college from the beginning was to give collegiate instruction in agriculture; but the need for experimentation and research was soon realized, and in 1915 the agricultural experiment station was established as an adjunct to the college. Research in connection with teaching expanded rapidly, and the staff of the college and experiment station have made many contributions to the science of agriculture.

The work of the college could well be expanded to provide for more research and to afford the staff means to study and travel in foreign countries. The economics division of the college has made some creditable contributions, but it is very small and needs greater facilities for research and survey work.

The Bureau of Plant Industry is the branch of the Insular Government in charge of crop research, insect- and plant-disease control, and plant-propagation work,

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whereby improved plants and seeds are produced in experiment stations for distribution among farmers. This Bureau also makes studies of farm management and agricultural industry, and carries on research and extension work in crops and household sciences.

The Bureau of Plant Industry needs more field stations and a central experiment station, where new plant varieties and cultivation methods from other countries could be tried out in connection with the work of the substations in each separate agricultural region of the Islands. The regional stations could then test the seeds for local conditions and carry on experiments in systems of crop rotation, etc. There is a large field for experimentation on varieties adapted to commercial production in different parts of the Philippines, as well as on those that would provide a better balanced supply of foods. Until recently, facilities for agricultural extension work were extremely meager and were carried on chiefly through the agronomy substations.

Commonwealth Act No. 85 created the positions of provincial and local agricultural supervisors. This law gives authority to supply the great need of additional personnel for agricultural improvement work, but it may prove to offer difficulties in administration, involving as it does certain local considerations in the selection of projects, etc.

Specialists in the Bureau of Plant Industry and in allied work of agricultural improvement have at present little opportunity for study and observation outside the Philippines to fit them better to meet the urgent problems of crop adjustment and planning now arising. The need for such opportunity is becoming increasingly apparent.

The Bureau of Science has been doing extensive work in problems connected with agriculture, particularly in the utilization of plant and forest products. The work in soils was formerly part of that Bureau.

The Bureau of Animal Industry, with the allied veterinary college, is carrying on research and extension work in animal improvement, disease control, and feeding methods. It is also making valuable studies of animal product utilization.

#### **FORESTRY AND LAND-USE PROGRAMS**

Forestry lands are one of the great resources of the Philippines. The area in forests is estimated at more than 44 million acres, or approximately 57 percent of the total land area of the Islands. This does not include the 3 million acres of forest land covered with bamboo, which may be utilized for grazing. About 97.5 percent of the forest area is owned by the government. There are about 3,000 species of trees that attain a diameter of 1 foot or more. Fewer than 60 of these species, however, are brought to market. The volume of standing commercial timber is estimated at 465 billion board feet.

Lumbering is one of the principal industries of the Islands. On an average, only about 16 percent of the production was exported during the last 5 years. In

spite of the abundance of timber, a yearly average of 3,658,000 board feet, valued at 2,102,000 pesos (\$1,051,000), was imported during the same period. These imports are of special classes of lumber for specific purposes.

In addition to the value of the timber there are a number of minor forest products, among which are palm products, tanbarks, firewood and charcoal, fibers, resin, gum, oils, rubber and gutta percha, medicinal plants, and other similar products. Among the most important medicinal plants may be mentioned cinchona, the basis for quinine, and tarac-togenos, from which chaulmoogra oil is extracted.



Figure 15.—Young rubber plantation.

The administration of forests is in charge of the Bureau of Forestry. The cutting of timber and other forest products, for either personal or commercial purposes, and the occupancy of forest lands are governed by regulations promulgated by the Director of Forestry and approved by the Secretary of Agriculture and Commerce.

The greatest problems in the administration of Philippine forests are those of preventing illegal cutting of timber and other forest products and the control of natural forest enemies and fire. The caingin system is not only destructive of forest resources but rapidly exhausts the soil. This system accounts for the existence of extensive bamboo groves all over the country and badly eroded places, and has reduced the land to submarginal or marginal areas.

To reforest the waste land that cannot be profitably used for agriculture, the Bureau is undertaking planting in a number of provinces. There are seven regular reforestation projects located in different parts of the Islands. Since 1927 more than 2,500 acres have been reforested. These projects are very important, not only in conserving the soil and timber supply, but in conserving the water supply and minimizing and regulating floods, protecting game and animal life, and eradicating insects and other pests. For the protection of the public interest in spending the money appropriated for reforestation, the Bureau of Forestry first inspects and surveys the areas to be reforested to determine their permanent value.

One of the foremost problems in the conservation and management of Philippine forests is land classification. The administration of Philippine forests involves the conservation of timber, the reclaiming of land from which timber has been cut, and the releasing of certain timber land for agricultural purposes. The funds available for carrying out this work have not been sufficient, and the classification of

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the forest lands, which is the first essential, has on that account been proceeding very slowly.

In order to release new land in the most advantageous areas for farming, particularly in Mindanao, an endeavor is being made to speed up this work, and proposals have been made to obtain the appropriate facilities. Commercial forest areas will be subdivided into natural logging units, which can be allocated to licensees on the basis of quality and quantity of existing forest products rather than on the basis of area, as they are at present. Large areas are now granted to licensees who cannot log them within a reasonable time. The result is that big stands of timber are withheld from immediate utilization.

In connection with the forestry program, inspecting and grading lumber and timber will be improved, thus protecting the reputation of Philippine woods in foreign markets.

More extensive research in the utilization of forest products is being planned through a central forest-product laboratory and forest experiment stations at different points, so that environmental factors may be properly studied and correlated. It is hoped that the laboratory, in addition to studying the properties of different woods for specific purposes, will discover materials suitable for pulp and paper making and furniture manufacturing, and methods of preparing resins, oils, gums, and other forest products for industrial use.

Studies are also to be made of the forest reserves and national parks with relation to their best use by the population, as well as to insurance against timber famine, soil erosion, and destructive floods. In connection with the land-classification work, a grazing survey is suggested to provide suitable grazing units and improving the carrying capacity of the ranges.

The forestry school of the Philippines has been brought to a high standard to provide trained specialists. The alumni have found ready occupation in the forest service of the Philippines, and a number have even been taken into the forest service of foreign countries.

#### **AGRICULTURAL MARKETING CONDITIONS**

On the whole, problems of marketing are more important than problems of production. Many products can be grown successfully, but production in quantity has heretofore been discouraged because of the absence of a satisfactory market. Lack of grading systems, warehouse facilities, and adequate credit have resulted in very low returns to producers.

Difficulties in marketing exist particularly for rice, leaf tobacco, and copra. Large numbers of rice producers are forced to sell their crops at extremely low prices, partly because of advances made to them on the crop during the season. Tobacco producers are subject to various deductions, which, through lack of organization, they are powerless to resist. Advances to tobacco producers are frequently



Figure 18.—Marketing scene.

country points barter is still extensively practiced. Planters take small quantities of copra or other products to the owner of a small store, who is usually an alien merchant acting as a local buying agent, to exchange for supplies, implements, or clothes. In this transaction the farmer is at a disadvantage. His goods are low-priced, and the cost of the goods he buys is high. He gets barely enough to pay him for production expenses, while the middleman makes a double profit - on the articles bought from his store and on the resale of the copra or corn he receives from the farmer.

Abacá is the chief important crop having definite grades. The Fiber Inspection Service performs the tasks of issuing fiber grading-baling permits, baling fiber, and shipping bales, as well as determining and describing official standards for certain Philippine fibers. According to the manager of this Service, the farmer usually does not know the grades, nor how to produce abadá of good quality. If he knew grades and current prices, he could sell to better advantage and might produce a higher quality.

Over a large part of the Philippines marketing of major crops is in the hands of Chinese merchants. Few large producers sell their crops directly to consumers, and middlemen make large profits.

In Davao some planters of abadá and copra, especially Japanese, have formed cooperative-marketing associations. When an association has accumulated a sufficient quantity of fibers it notifies the principal buyers of Davao of the date of auction. The abadá is weighed and separated into lots or parcels. Buyers offer their bids in writing, deposited in a closed box. When all parcels are bid for, the box is opened in the presence of all parties and the highest bidder for each lot is awarded the purchase. He is required to deposit 20 percent of the price and the balance must be paid within 3 days. If the products are not removed on the day of purchase or within the 3-day period, the buyer has to pay a storage fee.

made under agreements that bind them to sell to the lenders. A very low price is offered by buyers as soon as buying begins and when delivery by producers is demanded.

In the copra industry small planters, who supply not less than 80 percent of the yearly production, are largely dependent upon rural middlemen in marketing their produce. These rural buyers are links in a long chain of intermediaries through whose hands copra passes on its way to the consumer.

Under the present system, copra has no definite grades or standards. In the provinces, sales are rarely made by grades. At many

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A copra association at Davao acts as agent for producers. When the association secures a contract, each member delivers his copra or a certain portion of it, sufficient to fill the contract. The proceeds are divided pro rata. Those who are not members of the association at Davao contract to sell their product to buyers offering the highest price. Small producers in distant rural communities barter with the nearest Chinese merchant.

Studies made at the College of Agriculture by members of the faculty and by students indicate the great difficulties of producers in marketing leaf tobacco. It was found, for example, that prices moved independently of economic laws and that buyers dictated prices to growers. The growers receive only from 33 to 40 percent of the wholesale price of leaf tobacco in Manila, whereas the margin taken by middlemen represents from 60 to 67 percent of the Manila quotation. Abacá growers of Albay Province, Luzon, received for their 1930-31 crop no more than 59 percent of the wholesale price in Manila, and the Chinese middlemen took 41 percent. Practically the same conditions have been found in the marketing of copra in Laguna and Tayabas Provinces, Luzon, and of eggs and chickens in Laguna. The marketing of rice in Nueva Ecija Province, Luzon, is also largely in the hands of middlemen.

Cooperative marketing has been suggested in recent years. In fact, the government encouraged this movement as early as 1924, and results of some of the studies show some progress. It is still in the experimental stage, however, and a large majority of the associations organized during the past decade have failed.

At the end of 1932 there were incorporated with the Bureau of Commerce 80 cooperative marketing associations handling tobacco, rice, sugar, copra, abacá, and palm vinegar throughout the Philippines. Only 40 of these, however, were in active business. At the end of 1935 there were 105 associations, but only 45 were in active business. Twelve were associations of rice growers, mostly in Nueva Ecija, and 13 were tobacco associations, mostly in the Province of Luzon.

There are numerous obstacles to the successful operation of cooperatives. It is difficult to secure competent leaders, who too often lack an understanding of local conditions and the ability to analyze marketing problems; moreover, members frequently do not understand the purposes of the association and lose interest and faith when higher prices are not immediately realized. Inadequate warehousing facilities make it difficult to hold crops for remunerative prices and to grade and classify products to obtain the best price through large-scale marketing. Proper credit facilities are not available for financing the storage of crops, and in some places the cooperatives have worked under the disadvantages of inefficiency and high organizational expense, resulting in the collapse of the association. Finally, insufficient business has frequently prevented economical operation in competition with existing private marketing agencies.

Students of the cooperative marketing enterprise in the Philippines believe it can still succeed, despite these handicaps, as some successful cooperatives have demonstrated. They believe that the first step should be the reorganization of some cooperatives and the elimination of others.

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The following comments relative to problems of marketing in the Philippines are those of the Joint Preparatory Committee on Philippine Affairs: ". . . in view of the present early stage of development in the educational and financial status of many Philippine farmers it might be desirable that, instead of encouraging the formation of farmers' cooperative marketing associations, the Government should finance and operate a system of agricultural marketing and purchasing organizations on a non-profit basis."<sup>19</sup>

#### LACK OF PRODUCTION AND MARKET INFORMATION

A considerable handicap to effective marketing is lack of reliable information concerning prices and actual market conditions. At present the grower is usually at a disadvantage in dealing with agents or buyers, who in most cases possess better and more complete information. A service to issue timely and widely diffused market information would be of immense benefit to the Philippine farmer.

At the present time, the system of issuing information on crop prospects throughout the season and even of production at the end of the season is quite inadequate. Reports on some important crops are not issued for over a year after the end of the season, and in the meantime farmers must depend upon unofficial and trade reports. The Statistics Division of the Department of Agriculture and Commerce is bringing together economic and other information, as well as their means permit. Data of a wider scope and more timely reports are needed to plan marketing and production.

#### TRANSPORTATION FACILITIES

The problem of better transportation in the Philippines ranks high in a program of agricultural improvement and readjusted production such as is now contemplated. If the Philippines are to produce more of the products they consume better transportation is a prime necessity to move products rapidly and cheaply from producing to consuming areas. The development of adequate transportation in order to open new and undeveloped areas, relieve congestion, and make better use of the land resources is also demanding attention.

Another reason for the improvement of transportation is the desirability of advancement of rural education through more easily accessible schools and extension of agricultural and health improvement work - both necessary preliminaries to a program of economic expansion. Improved communication would aid in bringing together and unifying the various types of people through common ideals and understanding. Such facilities would also permit better control and defense of the country.

The improvement of transportation necessitates building more trunk roads, developing inter-island shipping, and, above all, building farm-to-market roads to serve small farmers. An extension of railway facilities is not at present considered important.

<sup>19</sup> Joint Preparatory Committee on Philippine Affairs, *Report of May 20, 1938*, p. 143.

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### SUMMARY

Far-reaching adjustments in Philippine agriculture and economy are contemplated to offset inevitable losses in export trade and to bring about a better all-around utilization of natural resources for a more satisfactory rural standard of living.

The acreage of sugar and tobacco, the agricultural products which will be principally affected, will be reduced by about 618,000 acres. A shift in these and other export crops to lower-cost producing areas is in prospect. The acreage of abacá and coconuts may not be changed materially, but increases in the acreage of such crops as rice, corn, cotton, kapok, cassava, lumbang, cacao, coffee, vegetables, various fruits and nuts, derris, and spices are expected. Production of livestock and poultry will be increased to supply domestic needs for most of the dairy products and most of the animal products now imported.

It is believed that production costs can be materially reduced through variety and cultural improvements. Better use of land and labor can be effected by moving farmers from congested areas and enabling the use of labor throughout the year in older areas by more diversified cropping systems. The establishment of adequate facilities for marketing, including warehousing credit and widespread adoption of grading systems, will result in materially enhanced returns to farmers. Some encouraging expansion of transportation facilities is evident, which, if continued, will reduce marketing costs and permit a more widespread commerce. The position of agriculture will also be strengthened by reallocation of taxes and the building up of new sources of revenue.

It is planned to increase efficiency of the rural population by the introduction of measures providing for improved health and educational facilities. The possibility of land holding is to be made easier and the tenure and position of the tenant improved.

These fundamental adjustment and development measures in agriculture are to be supplemented by better utilization of forestry and fishery resources. Small-scale industries are to be fostered by the National Development Company. Mining resources are also to be studied as a possible source of additional national income.

It is not believed that a highly industrialized system of economy for the Philippines is feasible because of the lack of experience on the part of Philippine industry in competing with other countries in important world markets. Although the Philippine Islands have the necessary basic material for industrial development, it would take time and capital.

The alternative, however, is not reversion to a purely agricultural economy, for countries having a purely agricultural economy are in a very difficult position at present unless they have a virtual monopoly of certain commodities. The Philippines in particular are open to competition from other countries in their production of highly competitive tropical products. Wages are very low in many of the

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nearby countries, and it is believed that even with the increased efficiency of production expected in the Philippines, it would be difficult to compete with them.

The tendency in planning is therefore toward a semi-agricultural, semi-industrial system. The prospective loss in current exports can be made up only in part by new exports, and therefore imports must be reduced. Certain agricultural imports can be produced in the Philippines, but there still remains a volume of industrial products that cannot be paid for by exports. If the country is not to reduce drastically its consumption of such industrial products, it is believed they must be produced in the Philippines. This necessity has given rise to various programs for small-scale industrialization.

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## PART II. COMMODITY STUDIES

In Part I of this report, the physical conditions and historical developments affecting Philippine agriculture and its problems of adjustment were discussed, and the general policy being formed with respect to the future economy was summarized. It was pointed out that by means of increased production it would be possible to produce domestically some items now imported, and that a few products offered possibilities of increased exports. Part II consists of a discussion of the present position of certain commodities, particularly with regard to future prospects.

The commodities discussed in this section<sup>20</sup> may be classified as (1) export crops - sugar, tobacco, copra, and abacá, including those crops chiefly affected by the decline of trade preferences; (2) chief subsistence crops, such as rice and corn, which have been supplemented in many seasons by imports; and (3) minor crops consumed for food or other purposes. Some of these are not now produced in sufficient quantities for domestic consumption, but could be. Examples are cotton, cassava, coffee, vegetables, various fruits, nuts, and oil-bearing plants. Some of these could also be produced for export, as could such commodities as certain forest and tree crops, medicinal plant products, derris root, kapok, ramie, and rubber.

The general potentialities and problems of the livestock industry are outlined in view of present and expanding domestic needs.

In devising an adequate program for crops and livestock more study is needed of agricultural facilities and of foreign and domestic markets. Problems of low-cost production are fundamental in producing crops to meet foreign competition. Adaptation of suitable varieties involves further foreign market study and the importation of plant material, as well as experimentation on local varieties. Plant disease and pest control greatly affect yields in tropical areas. Suitable livestock breeds must be developed and more adequate domestic feed supplies provided.

Of great importance in carrying out any program of crop and livestock improvement is the development of increased human efficiency through education and health measures, and the offering of better returns as an incentive.

All of these problems are recognized by interested public agencies in the Philippines, and notable progress has been made in setting up facilities to meet the needs. In certain respects, however, the initiation of necessary measures has been somewhat slow. Further progress is expected in the near future.

<sup>20</sup> For more detailed information on the commodities discussed, the references listed in the bibliography at the end of this article may be consulted.

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## SUGAR

## STATUS AND HISTORY

*Status:* The sugar industry has become important in the general economy of the Philippines because of the value of the export trade and as an important source of revenue to the government, estimated at 20 million pesos (10 million dollars).

It is estimated that approximately two million Filipinos depend directly or indirectly upon the sugar industry for their livelihood. With a necessary readjustment in the sugar industry, the income of a large number of people and a major source of government revenue will be affected; therefore, the problems before the industry are of paramount importance. There must be a shift to better sugar-producing areas, and improved cultivation methods must be adopted as rapidly as possible to increase yields and lower the cost of production; marginal land no longer planted to sugar must be used for other crops which will yield as nearly as possible an equivalent income; sugar centrals in nonproducing areas must be diverted to other crops; other markets for and uses of Philippine sugar must be found.

Since the cultivation of sugar was naturally adapted to the Philippines even before there was much effort to increase its production, it is believed that sugar production can survive to a significant extent and can furnish a reasonable standard of living for those connected with it.

*History:* A review of the Philippine sugar industry may be divided into three periods: (1) a long, slow development prior to American occupation; (2) the more rapid development during the period of American occupation under the privileges of duty preference; and (3) the future prospect. In 1941 export taxes on sugar will go into effect, followed by successive increases in duty up to payment of full duty in 1960. The sugar industry during this period will be forced to adjust itself gradually to free competition in the world markets.

~~PRODUCTION~~

The Philippine sugar industry is operated on a basis different from that of other cane-producing areas. In Hawaii, centrals operate large estates controlling their own production. This is practiced to only a small extent in the Philippines.

Individual planters and tenants in the Philippines operate under a milling contract with the central, under which the planters are obliged to have their cane milled by the contracting central, which in turn is obligated to furnish transportation for the cane and to convert it into sugar. The share of the planter is frequently divided between tenant and landowner, the latter receiving from 10 to 20 percent of the total crop as rent.

*Areas and types of production:* The sugar-producing provinces in order of their importance are classified by the Philippine Bureau of Plant Industry as follows: Oriental Negros, Occidental Negros, Laguna, and Capiz, which together comprise about

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half of the sugar area of the Philippines; Mindanao, Pampanga, and Batangas, about one-sixth of the total area; Tarloc, Iloilo, Leyte, and Bataan, somewhat less than one-sixth; and Cebu and Bulacan, about one-twelfth. Yields from the other provinces vary greatly.

There has been a constant improvement in the variety of cane, although not equal to that in other important producing areas. The dominant varieties are Luzon White, Cebu Purple, Badilla, P.O.J. 2078, Pampanga Purple, and Maritius 1400. Other varieties which have been recently introduced and developed are being extended.

*Climate:* The climate map of the Philippines (p. 388) shows that sugar is produced chiefly in areas of the first of the two types of wet and dry seasons and in areas of the intermediate type with no very pronounced maximum rainfall. In a few districts irrigation is practiced where water is available from rivers and can be conveyed to the fields by canals.

*Labor problems:* As considerable labor is needed for harvesting and planting within four to six months' time, the available supply of labor is important, and has always been one of the serious problems of the sugar industry. Failure of the Spanish Government to give the necessary assistance to planters in obtaining an adequate and dependable supply of labor was one of the chief causes of slow progress in the development of the industry during the Spanish regime.

Efforts have been recently made to establish an 8-hour day with a minimum wage of 1 peso (50 cents). At present unskilled manual labor is paid a minimum wage of from 40 to 60 cents a day, semiskilled laborers from 60 cents to \$1.25 per day, and skilled laborers from \$1.25 to \$3.50 per day. Laboratory technicians and office workers receive from \$100 to \$200 per month. The salaries of department chiefs and senior executives are, of course, considerably higher.

Unskilled plantation laborers are generally paid from 15 to 25 cents per day; skilled laborers such as foremen, mechanics, and truck drivers receive from 50 cents to \$1.00 per day. Both groups are usually provided with housing facilities.

#### AJUSTMENT PROBLEMS

It is believed that by the use of better varieties of cane the present production could be maintained on less than half of the present area of 642,460 acres, which would leave about 370,650 acres of marginal sugar land for conversion to other crops. Some of the poorest land may revert to pasture.

To what extent the use of land better adapted to sugar growing can reduce the cost of production and whether the product will be able to withstand the competition in a free market cannot be determined. It is assumed that even with the use of better sugar lands, the cost of production cannot be decreased sufficiently to offset the amount of the preference, and that Philippine sugar will not be able to compete to a significant extent; in any event, total revenue to the Islands from exports of sugar must be considerably reduced.



Figure 17.-Coconut plantation on the island of Mindanao. Note the young trees planted to replace the old ones as they die.

## COCONUTS

### STATUS AND HISTORY

*Status:* The coconut and its byproducts have become important in comparatively recent years as a source of vegetable fats for human food. Coconut production increased rapidly in 1910 and now comprises about 15 percent of the area planted to leading crops, exceeded only by rice. The Philippines is the chief exporter of coconut products, not only because of the enormous area planted but also because the per-capita consumption of the country is small compared with that of other producing areas. The United States takes nearly all the coconut oil, about 75 percent of the copra, about 40 percent of the desiccated coconut, and 40 percent of the copra cake or meal; it imposes a 3-percent excise tax on coconut oil from the Philippines, which is returned to the Philippine Treasury but cannot be used to subsidize the industry.

*History:* The coconut industry is one of the oldest and most important in the Philippines. The demand for copra and coconut oil was greatly stimulated during the World War, when the acreage planted to coconut palms was expanded and a coconut oil industry developed. At the end of the war there were more than 40 crushing mills in operation in the Philippines; however, with the cessation of hostilities the oil and copra cake industries declined. At present there are 8 oil plants engaged in the production of coconut oil for export, and 10 small mills crushing oil for local consumption. The survival of the industry on an export basis was made possible by the United States Tariff Act of 1922, which imposed a duty of 2 cents per pound on coconut oil and has served to practically exclude imports into the United States from other sources.

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#### PRODUCTION

Tayabas and Laguna are the leading coconut-producing provinces, although Bohol and Mindanao are also important.

The coconut is subject to various diseases and insect pests, but losses from these causes are probably not so great as in some other important areas. Beetles and weevils are the most destructive of the pests.

Most of the copra produced is at present partially dried over a tapahan, or kiin; however, a considerable quantity, especially in the Visayas, is sun-dried. This method produces a higher-priced article, free from creosote. Artificial driers are coming into use, and it is believed that their general adoption will improve the status of the copra market. The quality of Philippine copra ranks low compared with that of other countries, largely because of the faulty methods of preparation. About one-fourth of the world's copra is produced in the Islands.

Since coconut lands cannot easily be reduced, and because of the free entry of copra into the United States, the problem of the industry is the efficient production of copra of good quality. By crop diversification it may be possible to make the copra marketable at a profit. The use of coconut oil in Philippine industries may partly absorb the output of present mills. If a system could be devised which would give the farmers the benefit of orderly distribution, the industry would not suffer severely and the economic adjustment of the coconut regions could be accomplished more effectively.

Improvements in marketing methods, with resulting better returns to the producer, will unquestionably promote a higher-quality product, a factor of great importance to the future position of the industry. Poor shipping facilities have also been a great handicap.

#### ADJUSTMENT PROBLEMS

With the decline in trade preferences with the United States it is not expected that oil crushed in the Philippines can compete with that produced in this country. Copra, if continued on the free list, will not be so greatly affected, and will substitute for oil exports. The ability of desiccated coconut to hold its position will depend upon its ability to compete with the Ceylon product.

In view of the uncertainty regarding future exports, greater industrialization of the various coconut products is considered an urgent need. At present only about 20 percent of the total production is consumed locally, and about 85 percent of the rest is exported to the United States in various forms.

A part of the surplus resulting from the decline of trade preferences can be utilized in the manufacture of products for home consumption as a substitute for certain products now imported, such as soap, vegetable butter, lard, cooking oils, etc. Certain other products of less importance may also be produced.

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## ABACÁ

### STATUS

The acreage planted to abacá (Manila hemp), which first became an important export product in the latter part of the nineteenth century, has not increased greatly since 1910, although there has been a gain in yield. The principal producing provinces are Davao, Leyte, Sorsogon, Samar, Albay, and the Camarines. The latest figures show a total of about 1 million acres, producing about 400 million pounds, valued at approximately 12.5 million dollars.

### PRODUCTION

One of the most serious problems confronting the industry is the improvement of methods of selling and marketing. More familiarity with grades and current prices and aid to producers in organizing marketing associations would improve marketing and quality.



Figure 18.-Bales of abacá (Manila hemp) ready for shipment.

Organization of a National Abacá and Other Fibers Corporation is reported to be pending, to help producers in selling with the greatest possible efficiency and economy. During the last few years the price has risen, but the producer, lacking organization, could not benefit from the increase. The Japanese in Davao have a marketing organization, and have been able to expand their production many times, whereas Philippine production there has been reduced.

It is believed that production can be increased by elimination of marginal lands, improvement of varieties, introduction of improved methods, and disease control.

### ADJUSTMENT PROBLEMS

It is not anticipated that it will be necessary to reduce production of abacá as long as it continues to enter the United States duty free. The United States only takes a third of the present exports. Greater utilization in the domestic market and production of certain products for foreign markets can be developed. Part of the waste left on the plantation after stripping can be utilized for the manufacture of various cellulose products.

## TOBACCO

### STATUS AND HISTORY

*Status:* The total area of tobacco grown in the Philippines is estimated at about 160,615 acres, or less than 2 percent of the area of leading crops. About 79,365,600 pounds, with a gross value of about 2.5 million dollars, are harvested annually.

Although the area planted to tobacco is small, it ranks high as a manufactured and export product, and government tobacco revenues are estimated at around \$5,000,000. It is estimated that the industry supports approximately 100,000 employees and their dependents. About half the annual production is exported in the form of cigars, cigarettes, and leaf tobacco, which together rank fifth in Philippine exports.

*History:* Tobacco was introduced into the Philippines during the last quarter of the sixteenth century, and developed principally in the provinces of Cagayan and Isabela. Tobacco growing became very important with the establishment of a tobacco monopoly in 1781 by the Spanish Government. This monopoly supplied at least half the revenue for colonial government expenditures, but because of unsatisfactory practices and dissatisfaction of growers, it was dissolved in 1882. The industry, however, continued as one of the most important in the Islands.

### PRODUCTION

*Areas and types:* The principal tobacco-producing region is the Cagayan Valley in Luzon, noted chiefly for production of cigar filler. Batek and shade-grown wrapper are found in La Union and Pangasinan; open-grown wrapper in the Cagayan Valley, southern Luzon, and in parts of Mindanao. The production of aromatic cigarette filler is at present limited to regions with well-defined dry and wet seasons, such as central Luzon, where the leaves can be cured in the sun. The sun-cured product, however, does not compare favorably with the flue-cured.

There are also 4 minor types grown, although with the exception of Ilocana Batek their importance is local. These are: (1) the Turkish Samsoun Bafra variety, (2) the Suluoc; (3) the Batek; and (4) the Romero. All these minor types are strong and heavy.

*Cultural methods:* The chief difference between methods of cultivation in the Philippines and elsewhere is that glass and hot beds are not employed on the Islands. The seed beds are prepared and sown in September and October and transplanted in November and December. Harvesting starts in February and ends in April or May. Pruning is the only method of harvesting.

*Factors affecting production* The cost of production per acre varies according to type, but averages about \$44.62 for cigar filler \$81.75 for sun-grown wrapper, \$142.45 for shade-grown wrapper, \$40.47 for sun-cured Virginia tobacco, \$50.50 for flue-cured Virginia tobacco, and \$34.80 for miscellaneous types. These costs do not include interest on capital invested or depreciation of barns and farm implements.

As the crop is usually sold at the farm, baling and marketing expenses are not borne by the producer. However, if the planters bring their crops to central markets the cost of baling and transportation would be included in the sale price.

The worst pests are the cutworm and the long-horned green grasshopper. The cigarette beetle is very destructive to leaf tobacco and manufactured products. Chief diseases are green leaf spot, which affects the shade-grown



Figure 19.—Tobacco drying shed in the Cagayan Valley of Luzon Province.

wrapper type, and mosaic, bacterial, and Fusarium wilt diseases, which affect open culture types.

#### **ADJUSTMENT PROBLEMS**

At the present it is estimated that there already is an overproduction of Philippine cigar filler, and that this will need to be reduced. According to estimates of the Bureau of Plant Industry, it may be necessary to retire some 44,478 acres of tobacco land, partly because of the loss of United States trade and partly because of present overproduction. It is believed that cigarette leaf tobacco could be grown to an important extent to substitute for cigarettes now imported. With further progress in production methods, domestic wrapper would also tend to replace American wrapper. Reduction in imports of Philippine cigars into the United States is expected to diminish requirements for wrapper correspondingly.

## **COTTON**

#### **STATUS AND HISTORY**

Cotton has been grown in the Philippines since the Spanish occupation, chiefly in the Ilocos provinces. It was never a very important product, but the acreage at the beginning of the American regime was somewhat larger than today. Production has been maintained chiefly for home weaving. The area planted to cotton was reduced from some 7,413 acres in 1912 to less than 1,235 acres in 1931. It has now increased again to more than 4,942 acres, due to recent interest in certain districts in cotton as a minor crop and to promotion by the Bureau of Plant Industry.

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#### PRODUCTION

*Varieties and yields:* The two chief varieties developed have been Batangas White and Kapas Purao.

In northern Mindanao some significant interest in cotton is being shown in the province of Misamis Oriental. Yields of 180 pounds of lint per acre have recently been attained without much difficulty. The Bureau of Plant Industry is the chief buyer of cotton from this district, and some is shipped to a company in Manila. If the farmers were sure of a market, there would be an additional increase. The yield in this province from different plantings varied from about 153 pounds of lint per acre to about 500 pounds per acre. The average, including that destroyed by insects and carabaos, was about 168 pounds of lint per acre. Length of staple was one inch for Batangas cotton grown on rice and corn land. Under such a system corn is planted from March to May, and cotton from September to November.

*Factors affecting production:* Success in the growing of cotton in the Philippines depends to a large extent on planting at the proper time. This varies in different sections, but the fundamental principle is to bring the plants to maturity not later than the middle of the dry season.

Cotton has in the past been grown as a dry-season crop, planted at the close of the rainy season and harvested during the dry season. Weather conditions and the instability of the season have made a consistent production difficult. The regions found most suitable by the Bureau of Plant Industry have been the provinces where it was previously grown for many years, with the addition of Cebu, Iloilo, Negros, and parts of Mindanao.

Cotton in the Philippines is subject to many pests, chiefly the boll weevil. The diseases that have been reported are the angular leaf spot disease, leaf blight, anthracnose, and such others as rust and Cercospora leaf spots.<sup>21</sup>

*Cost of production:* According to investigations by the Bureau of Agriculture the cost of producing one acre of cotton is \$8.44.<sup>22</sup> It seems that cotton can produce satisfactory yields under proper soil and climatic conditions, but its production on a large scale necessitates study of important problems of marketing and utilization.

#### ADJUSTMENT PROBLEMS

With government aid and instruction in cultivation now being instituted by the Bureau of Plant Industry, it seems that cotton can eventually be made profitable as a minor crop. Certainly if other crops, such as tobacco, decline following the reduction of trade preferences, then interest in cotton growing will respond to its own relatively improved position.

<sup>21</sup> Otanes, Faustino O., and Butac, Filomeno L., *A Preliminary Study of the Insect Pests of Cotton in the Philippines, with Suggestions for Their Control*.

<sup>22</sup> Elayda, Aniano, and Jesus, Francisco de, *Farmers Circular No. 10*.

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According to the tentative program of crop adjustments, some 741,000 acres are to be set aside for cotton production. This is more than the area needed to produce the equivalent of the yearly importation of total cotton goods, which would be only about 556,000 acres. Requirements for coarse cotton goods which could be easily manufactured are considerably less, estimated at an equivalent production of some 86,000 acres. The Commonwealth's new settlement project in Mindanao envisages the planting of some 124,000 acres of cotton as one of the cash crops.

## RICE

### STATUS AND HISTORY

*Status:* Rice is the basic food of the Philippines. About three-fourths of the population eat rice; the rest consume more corn, and, in centers of population, more wheat bread and other bakery products. The per-capita consumption of rice averages about 4 bushels of cleaned rice, according to the Rice Commission. Only in times of acute economic distress will the people resort to cheaper substitutes. About 4 million people are engaged in rice production, in addition to those engaged in its transportation; and official reports indicate that about half of the total investment in all agricultural industries is in rice.<sup>23</sup> The area planted is approximately half that of the total crop area.

Despite the fact that rice is the most important commodity in the Philippines, the country has had to import about one-sixth of the amount consumed for a number of years; and during years of very poor rice crops, larger imports have been necessary. In times of unusual scarcity small imports have even been made from America. In years of large crops, producers have realized only a small return, and conditions generally have not been encouraging.

*History:* In the years prior to American occupation rice was normally imported only at times of crop failure, and during the 1880's it was listed as an export crop. Because of the development of important export crops such as sugarcane, coconut, and abacá, however, rice production has not expanded sufficiently to keep up with the demand. The percent of the total area in important crops planted to rice since 1910 has fallen from 52.63 to 48.76, although the acreage has increased nearly 2.4 million acres. Yield per acre increased until 1918 but has shown little change since then.

The Rice Grower's Association, which in 1936 became the Philippine Rice Association, was established to promote the interests of the rice industry in the Philippines. The Philippine Rice Commission was created in 1936 by executive order for the purpose of investigating the rice problem, recommending relief measures, and studying ways of insuring at all times a sufficient supply to prevent the recurrence of a rice shortage. As a result the National Rice and Corn Commission was established

<sup>23</sup> Report of the Rice Commission, Manila, March 6, 1936.

as a subsidiary of the National Development Company. The Commission is authorized to import rice free of duty in the event of a deficiency in supplies, and to sell it at prices maintained at a fixed level. To maintain this level and provide for holding surpluses, the Commission is required to buy rice when the cost falls below the determined standard price. Such purchases are to be deposited in licensed and bonded warehouses and surpluses carried for three years, after which they must be reduced by export. Any loss is to be financed by a tax on imports.

#### VARIETIES AND BYPRODUCTS

*Varieties:* More than a thousand varieties have been tested by the Bureau of Agriculture. The varieties used for domestic consumption belong to the nonglutinous group. About 80 percent of the crop is lowland rice, which is transplanted; the other 20 percent is upland rice, which is broadcast.

*Byproducts:* Rice meal, sometimes called broken rice, is excellent feed for cattle and pigs. Rice bran contains some kernel and corn and furnishes a very rich food. Rice hulls, produced by millers, are fibrous and unpalatable. They are, however, sometimes mixed with other byproducts for feed, and are most often used only for fuel. Rice straw is used for fodder, and in some kinds of paper.

#### CULTURAL METHODS

*Irrigation:* At present only a small percentage of the total area of the Philippines is provided with irrigation systems. These could be increased considerably in the rice-producing area. Where the land cannot be irrigated by gravity, it can be watered by pumps.

*Crop rotation:* Rotation is not so generally practiced in Philippine rice farming as it is in many other parts of the Orient, particularly in Japan. Rice is rotated with other crops, however, in a few localities. In some sections of Tarlac and Pampanga, corn is rotated with rice, and in many sections mango is planted in the rice paddies during the dry season. Crop rotation will be very helpful in improving the condition of the soil and increasing the yield. The use of commercial fertilizers is comparatively rare, but in some places, in connection with the proper system of cropping, will increase the yield materially.

*Threshing:* Several hundred threshing machines are now used by some of the big rice mills, principally of central Luzon. Individual farmers thresh their rice immediately after harvest, men and women or carabaos, treading out the grain. When labor and animal power are cheap, this manner of threshing may be adequate.

*Cleaning.* Poor farmers usually pound out the rice in a large wooden mortar. The process, rather slow and expensive, is used only when rice is intended for home consumption or when the farm is far from the mill. The rice does not receive so high a polish, but furnishes more food value than highly polished rice, as it contains more protein and phosphorus. Modern rice mills are gradually replacing the old-fashioned type. There are at present several hundred small mills, requiring

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engines of six or eight horse-power, which clean rice for local use. A few water-power mills remain in some provinces.

#### FACTORS AFFECTING PRODUCTION

*Pests:* Rice pests are a serious menace because of the difficulties of control throughout crop rotation and the presence of considerable grass and wild land. Locusts, rice bugs, stemborers, rice leaf insects, and cutworms do various amounts of damage. In some places, rats are also destructive.

*Cost of production:* It is believed that costs can be greatly reduced through a better system of harvesting, which at present, conducted on shares with extra labor, results in heavy costs. It might be possible to lower the cost of threshing by introduction of machinery used cooperatively, and arrangements for cheaper milling would also increase profits.

*Storage and credit:* Provisions for storage and credit to enable the farmer to control the marketing of his crops would enhance his profits, as at the present time he must pay usurious interest or an exorbitant share of rice for loans before harvest. Thus he is forced to dispose of his rice at the lowest price.

#### ADJUSTMENT PROBLEMS

It is believed very important that the Philippines produce their own rice supply, but production will have to be carefully regulated in order to prevent the accumulation of a large surplus which would further depress the price. Costs of production are higher than those of Indochina and Thailand (Siam), important nearby exporting countries; therefore, any surplus could not be disposed of profitably.

The future of rice production in the Philippines will be much affected by the readjustments necessitated by the loss of export markets. Agricultural products now imported - rice among them - must be produced domestically in quantities sufficient to offset such losses. The improvement of agricultural practices generally will also result in a more nearly self-sufficient economy and contribute to better conditions among the rural population, a factor considered to be of great importance to the success of political independence.

#### SUBSISTENCE CROPS

##### CORN

Corn ranks next to rice as a food crop in the Philippines. It is grown in every province, and its acreage has increased greatly in recent years. The expansion in acreage in the last 25 years has been much less than that of rice, but the percent of land planted to corn out of the total staple crop acreage has increased. Production is still short of requirements, as large amounts of both shelled and canned corn must be imported.

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Corn is eaten in all provinces, but in a few it forms the chief item of diet, particularly in Cebu, Oriental Negros, Bohol, Northern Mindanao, and the upper Cagayan Valley. These regions include about one-fifth of the population of the Islands. In many places where corn is an important item of the diet, two and sometimes three crops a year are grown. In the Cagayan Valley corn is frequently planted after the tobacco harvest.

#### WHEAT

At present very little wheat is grown in the Philippines, since the climate apparently is not well adapted to its production. Large quantities of wheat flour have been imported for several years, increasing with the American occupation. From 1925 to 1933 the Pacific Northwest supplied an average of 81 percent of such imports. In 1934 this average dropped to 65.3 percent and in 1935 to 26.1 percent, but it has since risen because of a subsidy. There have never been any flour mills of importance in the Philippines. Such wheat as is produced is ground in crude, primitive mills.

#### VEGETABLES

It is strange to note that the Philippines import large quantities of vegetables, which if grown locally would reduce the import balance and make possible a better adjustment of crops. Among these are beans, onions, cabbage, and potatoes. About 44,000 acres grown to vegetables would supply domestic needs.

All of these vegetable crops are now grown successfully in the Philippines. Many of them, because of their semitemperate nature, must be grown in the higher regions, but in most cases production could be expanded to meet domestic needs. One of the most successful recent developments along this line has been the increased production and improved type of Bermuda onions in parts of Luzon, northern Mindanao, and Iloilo. Cabbage production has been expanded in Benguet and in the Trinidad Valley in the vicinity of Baguio. It can also be grown in low altitudes if there is abundant moisture.

A large volume of peanuts is imported, although this crop can be grown. It is estimated that it would require more than 7,000 acres to produce the peanuts now imported. If it is desired to continue importing appreciable quantities from China, doubtless some export of agricultural products to China can be increased.

Soybeans, as well as many other kinds of beans, are grown successfully in the Philippines and could be used to diversify crops in certain sections. In the future they may be used more extensively as a substitute for meat and milk, if it is difficult to produce these items in quantities necessary to meet domestic consumption. Many other soybean products, such as soysauce, are becoming more popular. The Philippine Bureau of Plant Industry is conducting experiments on many varieties of soybeans and the College of Agriculture is also working on the adaptation of promising strains. Important amounts of soybean cake are imported from Manchuria for use as fertilizer, especially in market gardens. These imports could easily be replaced

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#### FRUITS

Considerable amounts of fruit are imported despite the large and varied production of fruits on the Islands; however, the Bureau of Plant Industry is making a study of domestic fruit production, and it is expected that imports of oranges can be reduced and exports of bananas, mangoes, avocados, and other fruits can be increased.

Experiments in canning and preserving of fruits carried on in the Division of Home Economics of the Bureau of Plant Industry have demonstrated that commercial canning could be expanded to enlarge the domestic market and make possible some increase in exports.

#### CACAO

Cacao is at present produced on a small area of 3,700 acres, which does not satisfy even domestic needs. It is believed that with careful cultivation over a period of years the cacao industry would be expanded to satisfy home requirements, and possibly to provide a small export trade.

Up to the present cacao has been grown under certain disadvantages compared with other crops. Yields vary considerably from year to year, due to weather conditions at the time the trees are in bloom; and it is difficult to secure acclimated varieties and to combat diseases.

Small plantings of cacao may be found in the Camarines, Cebu, Cavite, Iloilo, Batangas, Bulacan, and Tayabas, but it is not grown anywhere on a commercial scale. If grown extensively, specialists believe it would probably be advisable to select intermediate plateau lands with climates of seasonal rains, such as Mindanao.



Figure 20.—A field of cassava.

#### CASSAVA

Cassava is now grown successfully in many sections of the Philippines on an area of about 40,000 acres, and the entire production is consumed domestically. It is believed that it can probably be grown more extensively. An additional production of about 5,000 acres would be required to produce all the starch now imported; and to displace wheat flour, for which cassava flour may be substituted, an additional 49,000 acres would be necessary. It is thought that

it could be produced at a price that would admit it to world markets.

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Several attempts to manufacture starch in the Philippines have failed - probably because of poor planning. The chief difficulty has been the lack of an adequate supply of raw material, resulting from the inability of farmers to bring their cassava to the factories because of the high cost of transportation and the perishable nature of cassava tubers. Processing presents another problem; however, production on a plantation scale (as in the Netherlands Indies) in connection with the sugar centrals might prove profitable. Also, the highly developed agricultural technique employed in the sugar centrals would be valuable because of the strict market demands regarding color and quality, especially if starch is developed for export.

#### COFFEE

Coffee, like cacao, is at present grown in the Philippines on a very small area of about 3,700 acres. It was once a rather important crop in Batangas Province, and significant amounts were exported in the 1880's; but the industry was allowed to decline, principally because of the coffee blight. It is believed that this disease could now be combated by scientific means, since it has been successfully checked in the Indian coffee plantations; and that the industry could be revived, at least to the extent of meeting domestic needs. This would require only about 7,500 acres.

The Arabian types, which have the best flavor and aroma, require the highest elevations. If planted below 3,280 feet they are attacked by blight. The Robusta and similar types require an elevation of at least 1,475 to 2,460 feet for best development and do not thrive above 3,280 feet.

#### TEA

It is believed that tea production, which is at present insignificant, could be developed for export; however, this would seem difficult in view of the advanced state of tea culture and marketing in other parts of the world and the keen competition already existing. It can, however, supply at least domestic needs. Tea production would have the advantages of furnishing constant year-around labor, as one individual is required for approximately each third of an acre planted. Most favorable sites for tea production are Luzon, the highlands of Negros, and the higher sections of Mindanao.

#### NUTS

Cashew nuts, which can be produced fairly extensively in the Philippines, are imported into the United States in large quantities, and it is believed that production can be increased for export to this country and possibly other foreign markets, as well as for extended domestic use. One of the most important uses in the Islands at present is for the manufacture of wine from the fleshy fruit.

Pili nuts are coming into favor, and small quantities are now exported to the United States. It is believed that markets might be developed in other countries. The pili is also an important producer of resin.

## INDUSTRIAL CROPS

### RUBBER

Although the islands of Mindanao and Basilan are well adapted to its production, rubber is at present produced commercially to only a small extent in the Philippines, because of the presence in nearby areas of large plantations (particularly in the Dutch and British colonies) and because of the great outlay of capital necessary during the 15 to 17 years before the trees come to full bearing.

It is believed that rubber production can be made profitable by the establishment of small holdings, under supervision. The reports of one investigation<sup>24</sup> state that one family can take care of 5 acres of trees, including upkeep, tapping, and preparation of rubber. It is also calculated that even at a price as low as 5 cents per pound, the gross income would be about \$20 per acre after fifth-year planting and first-year tapping and about \$50 per acre at seventh-year tapping. These high returns assume the use of certain proved strains of budded rubber by the use of which about 200 trees per acre can be planted. It has been found that rubber trees cannot be grown at an elevation of more than 1,800 feet.

The new resettlement project, under which some 494,000 acres will be put into production on the island of Mindanao, requires that about 25 percent of this area must be devoted to rubber. If these plans are carried out, significant quantities will be available for export in five or six years.

### RAMIE

The production of ramie (China grass) is being introduced on a commercial scale by the Japanese around Davao, on areas from which old abacá has been cleared. It is said to give good results where the soil is quite fertile and the elevation not too high. The plant is cut and harvested by hand and requires a large amount of labor besides the stripping. Many striking claims are made for this fiber:<sup>25</sup>

"It is 8 5 times stronger than cotton, six times stronger than silk, four times stronger than flax or hemp. Parachutes made of it are six times stronger but weigh only half as much as materials now used. It will not mildew or rot and may be packed in storage indefinitely. Ropes, fishing lines, nets and sails will withstand 75 to 100 years of hardest wear and tear. Fabrics made of it are cooler than cotton and thinner than linen. It is finding favor as a filter cloth in the air-conditioning industry and has many other industrial uses. One ton of cured or dried ramie yields from 300 to 350 pounds of refined fiber, 1 500 pounds of cellulose flour, and 150 to 200 pounds of waste."

### OIL PLANTS

The production of many oil plants can be increased, but only a few are being considered at present. Palm oil and palm kernel oil could be produced, but their

<sup>24</sup> Report of Mindanao Exploration Commission, October 2, 1939.

<sup>25</sup> Ibid

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production has not yet attained commercial importance. The higher land in the island of Negros and elsewhere may be found suitable for these products.

The successful development of the oil palm on a commercial scale is dependent upon facilities for processing the fruit, which are quite costly; therefore the development of processing units in the Philippines would require sufficient plantations to support them. About 4 years are required before these trees begin to bear, and they are often interplanted with other crops, which compensate somewhat for the later maturity of the palm.

Sesame oil is common on the Islands but is considered a minor crop plant. The oil is used for cooking, and the seed for oil cake and for making candies and pastry. It is believed that the sesame oil industry might be moderately increased.

Certain essential oils which are now imported into the United States from other countries - such as geranium and citronella oil, which is obtained from a grass now produced mostly in Reunion - may be raised in the Philippines. The latter can be produced successfully on soils that are unfit except for carabao herding or pasture land.

#### LUMBANG

Lumbang is an important oil-bearing tree of the Philippines. It is now grown on an area of only about 3,000 acres, but it is believed that this acreage may be considerably expanded. Cavite, Batangas, Cebu, Laguna, and Occidental Negros, in the order named, are the principal lumbang-producing provinces, producing some 4 million pounds of kernel, valued at nearly \$200,000. The most important uses of lumbang oil are for making varnish and paints, for illumination, for soap manufacture, and as a wood preservative.

Because the cost of production is rather high, and since the trees do not begin bearing before 4 years, lumbang production requires a large capital and probably some encouragement from the government; however, as in the case of kapok, specialists state that the capital required would not be prohibitive if the land is already in cultivation to annual crops, or at least already an open site. After the trees come into bearing the profit per acre on the basis of recent prices seems very favorable. It is believed that there are possibilities for an export market and that, in any event, this crop will become increasingly important for domestic uses.

#### KAPOK

It is believed that kapok could, if improved, find an increased export outlet. Kapok trees may be found on all the Islands, especially on Cebu. The Philippine Bureau of Plant Industry states that the acreage in kapok could be more than doubled and the yield increased considerably. If production were expanded and facilities for removing the seed perfected, the Philippines might share in the export market now supplied by Java. It is probable also that the world consumption of kapok could be increased.

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#### SILK

It is believed that silk production in the Philippines could be increased to supply home consumption, at least for the more simple types of cloth. Figures on production are not available, but the fact that nearly 2.5 million dollars' worth of silk and its manufactures are imported annually shows that there is a large demand for silk goods. It is not expected that silk could be developed to the point of competing with other countries in the Orient where production and manufacture have been perfected for many years; but it does seem that production might be increased in certain localities as a very desirable supplementary source of home income.

#### DRUGS AND SPICES

##### DERRIS

Interest in the production of derris root as an export possibility has become active recently because of numerous inquiries from manufacturers abroad, particularly in the United States, regarding the possibility of securing commercial quantities of derris roots of high rotenone content.

The discovery of the use of the derris root as an efficient insecticide has created a large demand in the United States, Japan, and Europe. It has been found efficient both as a contact and stomach poison, and has a further great virtue that it is nonpoisonous to man and is therefore preferred for some uses to calcium arsenate. It is said to compare favorably with any inorganic insecticide, since in its application to even the youngest roots and seedlings no apparent injury is inflicted. Moreover, in addition to its value as an insecticide, derris, being a leguminous plant, is capable of enriching the soil. It can be grown on poor soil and prevents soil erosion, serving as a cover crop.

##### MEDICINAL PLANTS

Besides derris root, many crude drugs can be produced, such as aloes, belladonna, cinchona, nux vomica, crude papain, stramonium, coca leaves, sarsaparilla root, camomile (manzanilla), jalap root, and ipecac. Cinchona is discussed in Part I as one of the minor forest crops of commercial importance. It is believed that with more facilities for research and development, it can compete with other exports (see table 5, statistical appendix).

##### SPICES

There are many areas in the Philippines suitable for large-scale production of pepper and other spices. Until recently, however, pepper plantations of the usual size could be found in the Islands, and even at present the growing of pepper is confined largely to the region around Lipa, in the province of Batangas, where pepper is grown principally in the back yards for home consumption. Pepper can be interplanted

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with coconut, coffee, and similar plants, according to the Bureau of Plant Industry. At present Philippine imports total annually about \$25,000 worth of pepper, which could easily be produced domestically.

Other spices now imported into the Philippines which might be produced domestically include cardamon, cassia nuts, cinnamon, cloves, ginger, nutmeg, and vanilla. It is believed that cardamon would fit well into the plans of an all-around spice plantation, since it is a perennial which can be interplanted in a young tree plantation that is to bear other fruits. This product is now grown in central India. It is used in western cookery, in distilling fine liquors, and in medicine.

#### YLANG-YLANG

Ylang-ylang (ilang-ilang) is a local tree, whose flowers contain an oil useful in the compounding of perfumes. Before the World War there was a considerable industry in part of the Philippines in producing flowers and distilling oil. It is possible this industry might be revived, particularly for the local market.

#### LIVESTOCK

Among the animals raised in the Philippines are water buffaloes (carabaos) and cattle for use in field work and transportation, and as meat when their days of usefulness are over. Swine and poultry are raised for market or home consumption, and goats are used in large numbers for meat.

In 1768 a Royal Order was issued to compel raising of pigs and chickens. A commission was appointed in 1886 to study the rinderpest disease, but epidemics continued; and at the advent of the American regime it was one of the first problems considered by the authorities. An important part of the work of the present Bureau of Animal Industry, besides the improvement of breeding animals, is disease control. The Bureau has now stamped out rinderpest and is working toward improvement in anthrax control. Foot-and-mouth disease prevails, as well as surra and hog cholera.

For future progress, particular attention will be paid to the control of animal diseases, especially in Mindanao, where there are great possibilities for livestock. Centers of veterinary research will be established in new areas, and livestock breeding centers will be increased. Research in animal products to expand their industrial utilization, in the cure and preservation of meat products, and in the canning of milk and production of cheese, will be carried out.

#### CATTLE

In 1903 and 1904 attempts were made by the government to introduce Temperate Zone cattle into the Islands, but the animals were unable to adapt themselves to the climate and died. Breeds from India were then tried, and it was found that the various breeds belonging to the zebu group thrived, and were even better able to stand those regions having a long dry season than the so-called "native" cattle.

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Among the Indian dairy breeds the Scindi breed is to be preferred to any other. It is, perhaps, the best for milk purposes and has proved its adaptability to conditions on different parts of the Islands. The breed also serves well for general purposes. There are at present, however, relatively few Scindi cows in the Philippines, most of them on government stock farms. The average milk production per cow is only about 1 gallon per day, but it is believed that this may be increased by improvements in feeding and selection of stock. It is believed that breeds of cattle adaptable to Philippine conditions may be developed by crossing bulls of one of the dairy breeds on native Nellore or Scindi cows and their cross-bred offspring.

#### CARABAO

Attention is being given to improving the carabao, which plays an indispensable part in the agriculture of the Philippines. The animal is very hardy under tropical conditions, and in addition to being the principal beast of burden is one of the most important sources of meat. Its milk is the only kind consumed in some localities. The Bureau of Animal Industry is concentrating on producing cows of higher milk production, and it is hoped to develop a breed of milk carabaos. Cross-breeding of Indian buffalo bulls with native carabao cows is also being carried on.

#### OTHER LIVESTOCK

Experiments are also being carried on toward improving goats, sheep, swine and poultry through importations and selections and crossing with native stock. To improve the native breeds of sheep, purebred Shropshire sheep from the United States have been introduced. Shropshire and Indian sheep have also been crossed to produce a breed having the good qualities of both and adapted to local conditions.

Notable progress has been made in improving horses by the importation of Arabian stallions for crossing with native mares. It is believed it will be possible to maintain horses in the Philippines on a properly balanced ration of Philippine feeds without deleterious effects, but more experimentation in this direction is needed. One of the great difficulties is to find a suitable substitute for alfalfa.

#### BREEDING IMPROVEMENTS

The Philippine College of Agriculture has for a number of years been devoting attention to the improvement of breeding and feeding of livestock and poultry. They have established the swine breed called Berkjala by crossing the Berkshire and the Jolajala pig. They have started similar work on a breed of cattle using the Hereford, the Nellore, and the Philippine ox, but they have not entirely abandoned efforts toward acclimatizing pure occidental breeds. Various experiments in improving the ration for cattle and hogs, with special attention to providing an adequate supply of protein, have shown valuable results. The College of Agriculture has improved the Cantonese breed of fowls through selection and is attempting similar work with other breeds. In the breeding of livestock special attention is being devoted to the problem of disease resistance, and encouraging results have been achieved.

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## STATISTICAL APPENDIX

TABLE 1.—*Acreage of principal Philippine crops, 1929–1937*

| CROP                    | 1929    | 1930     | 1931    | 1932     | 1933     | 1934     | 1935     | 1936     | 1937     |
|-------------------------|---------|----------|---------|----------|----------|----------|----------|----------|----------|
|                         | : 1,000 | : 1,000  | : 1,000 | : 1,000  | : 1,000  | : 1,000  | : 1,000  | : 1,000  | : 1,000  |
|                         | : acres | : acres  | : acres | : acres  | : acres  | : acres  | : acres  | : acres  | : acres  |
| Rough rice .....        | : 4,387 | : 4,470  | : 4,425 | : 4,402  | : 4,580  | : 4,952  | : 4,853  | : 5,062  | : 5,093  |
| Corn .....              | : 1,273 | : 1,277  | : 1,295 | : 1,426  | : 1,554  | : 1,332  | : 1,401  | : 1,693  | : 1,631  |
| Sugarcane .....         | : 637   | : 640    | : 633   | : 625    | : 663    | : 756    | : 522    | : 620    | : 635    |
| Coconuts .....          | : 1,312 | : 1,361  | : 1,387 | : 1,399  | : 1,484  | : 1,503  | : 1,527  | : 1,562  | : 1,571  |
| Abaca' (Manila hemp) .. | : 1,198 | : 1,226  | : 1,198 | : 1,154  | : 1,105  | : 1,133  | : 1,206  | : 1,183  | : 1,242  |
| Tobacco .....           | : 204   | : 198    | : 184   | : 193    | : 184    | : 137    | : 152    | : 162    | : 183    |
| Maguey (fiber) .....    | : 92    | : 96     | : 93    | : 87     | : 76     | : 74     | : 78     | : 92     | : 94     |
| Cacao .....             | : 4     | : 4      | : 4     | : 4      | : 4      | : 4      | : 4      | : 4      | : 4      |
| Coffee .....            | : 3     | : 3      | : 3     | : 3      | : 4      | : 4      | : 4      | : 4      | : 4      |
|                         | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Root crops:             | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Cassava .....           | : 37    | : 38     | : 36    | : 36     | : 41     | : 35     | : 40     | : 40     | : 40     |
| Gabi (taro) .....       | : 29    | : 31     | : 29    | : 26     | : 29     | : 31     | : 32     | : 32     | : 32     |
| Sweetpotato .....       | : 220   | : 206    | : 178   | : 184    | : 184    | : 194    | : 186    | : 186    | : 185    |
| Ubi (yam) .....         | : 23    | : 22     | : 14    | : 14     | : 22     | : 26     | : 24     | : 23     | : 22     |
|                         | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Vegetables:             | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Beans .....             | : 25    | : 25     | : 26    | : 24     | : 23     | : 22     | : 22     | : 22     | : 19     |
| Eggplant .....          | : 19    | : 19     | : 23    | : 21     | : 19     | : 19     | : 20     | : 20     | : 20     |
| Mongo (mungo) .....     | : 30    | : 19     | : 22    | : 19     | : 19     | : 21     | : 12     | : 12     | : 10     |
| Tomato .....            | : 14    | : 14     | : 16    | : 18     | : 15     | : 16     | : 19     | : 20     | : 20     |
|                         | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Fruits:                 | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Banana .....            | : 268   | : 278    | : 278   | : 279    | : 256    | : 267    | : 235    | : 228    | : 228    |
| Mango .....             | : 37    | : 38     | : 38    | : 38     | : 38     | : 38     | : 37     | : 37     | : 37     |
| Papaya .....            | : 11    | : 11     | : 10    | : 10     | : 10     | : 10     | : 9      | : 9      | : 10     |
| Pineapple .....         | : 8     | : 9      | : 10    | : 10     | : 7      | : 7      | : 10     | : 10     | : 10     |
|                         | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Peanuts.....            | : 18    | : 19     | : 19    | : 19     | : 16     | : 16     | : 15     | : 15     | : 16     |
| Cotton .....            | : 0     | : 1      | : .1    | : 2      | : 2      | : 2      | : 3      | : 5      | : 5      |
| Kapok .....             | : 13    | : 14     | : 16    | : 19     | : 19     | : 18     | : 18     | : 19     | : 19     |
| Lumbang .....           | : 2     | : 2      | : 3     | : 3      | : 3      | : 3      | : 3      | : 3      | : 3      |
| Rubber .....            | : 6     | : 9      | : 9     | : 9      | : 9      | : 9      | : 9      | : 9      | : 9      |
|                         | :       | :        | :       | :        | :        | :        | :        | :        | :        |
| Total .....             | : 9,871 | : 10,042 | : 9,952 | : 10,025 | : 10,368 | : 10,630 | : 10,441 | : 11,075 | : 11,132 |
|                         | :       | :        | :       | :        | :        | :        | :        | :        | :        |

TABLE 2.—Production of principal Philippine crops, 1929-1937

| CROP             | UNIT    | 1929    | 1930    | 1931    | 1932    | 1933    | 1934    | 1935    | 1936    | 1937    |
|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                  | : Mil-  |
|                  | : lions |
| Rough rice ....: | Bu.     | 107     | 111     | 197     | 102     | 103     | 114     | 99      | 91      | 119     |
| Corn .......     | Bu.     | 14      | 15      | 14      | 18      | 17      | 14      | 12      | 15      | 18      |
|                  | : Thou- |
|                  | : sands |
| Sugar (cane):    | :       | :       | :       | :       | :       | :       | :       | :       | :       | :       |
| Centrifugal .:   | Ton     | 867     | 871     | 1,100   | 1,285   | 1,598   | 700     | 979     | 1,118   | 1,055   |
| Muscovado ...:   | Ton     | 77      | 51      | 42      | 29      | 23      | 26      | 28      | 31      | 27      |
| Molasses ....:   | Gal.    | 6,674   | 11,816  | 11,407  | 25,371  | 68,184  | 52,991  | 46,738  | 52,834  | 49,954  |
| Coconuts ....:   | Piece   | 2,156   | 2,057   | 1,869   | 1,944   | 2,142   | 2,114   | 2,874   | 3,147   | 2,983   |
| Copra .......    | Ton     | 529     | 507     | 463     | 448     | 521     | 524     | 682     | 717     | 575     |
| Oil .......      | Gal.    | 433     | 495     | 521     | 427     | 611     | 628     | 632     | 861     | 1,243   |
|                  | : Mil-  |
|                  | : lions |
| Abacá (Manila :  | :       | :       | :       | :       | :       | :       | :       | :       | :       | :       |
| hemp) .......    | Lb.     | 470     | 431     | 358     | 288     | 296     | 397     | 442     | 430     | 442     |
| Tobacco .......  | Lb.     | 105     | 102     | 96      | 100     | 92      | 72      | 63      | 71      | 74      |
| Maguey (fiber) : | Lb.     | 47      | 39      | 25      | 18      | 13      | 24      | 33      | 59      | 53      |
| Coffee .......   | Lb.     | 3       | 3       | 3       | 2       | 2       | 2       | 2       | 1       | 2       |
| Root crops:      | :       | :       | :       | :       | :       | :       | :       | :       | :       | :       |
| Cassava ....:    | Lb.     | 44      | 51      | 57      | 78      | 90      | 150     | 169     | 170     | 170     |
| Gabi (taro) ...: | Lb.     | 51      | 48      | 53      | 58      | 64      | 65      | 68      | 70      | 66      |
| Sweetpotato .:   | Lb.     | 417     | 392     | 388     | 491     | 465     | 511     | 443     | 439     | 438     |
| Ubi (yam) ....:  | Lb.     | 43      | 42      | 39      | 34      | 47      | 54      | 51      | 52      | 51      |
| Vegetables:      | :       | :       | :       | :       | :       | :       | :       | :       | :       | :       |
| Beans .......    | Lb.     | 10      | 9       | 10      | 11      | 9       | 10      | 11      | 11      | 9       |
| Eggplant ....:   | Lb.     | 16      | 19      | 24      | 24      | 22      | 23      | 23      | 24      | 24      |
| Mongo (mungo):   | Lb.     | 15      | 11      | 13      | 12      | 12      | 13      | 6       | 6       | 5       |
| Fruits:          | :       | :       | :       | :       | :       | :       | :       | :       | :       | :       |
| Bananas ....:    | Bunch   | 53      | 63      | 61      | 61      | 54      | 56      | 41      | 40      | 48      |
| Mango .......    | Piece   | 117     | 127     | 136     | 135     | 134     | 136     | 105     | 100     | 101     |
| Papaya .......   | Piece   | 38      | 39      | 39      | 40      | 43      | 40      | 31      | 29      | 28      |
| Pineapple ...:   | Piece   | 9       | 9       | 9       | 16      | 11      | 11      | 15      | 16      | 16      |
|                  | : Thou- |
|                  | : sands |
| Peanuts .......  | Lb.     | 9,043   | 9,367   | 9,793   | 9,945   | 9,226   | 8,023   | 7,366   | 8,100   | 8,333   |
| Cotton .......   | Lb.     | 0       | 143     | 163     | 324     | 390     | 439     | 434     | 1,085   | 1,100   |
| Kapok .......    | Lb.     | 1,391   | 1,530   | 1,737   | 2,731   | 2,765   | 2,564   | 2,963   | 3,104   | 3,117   |
| Lumbang .......  | Lb.     | 3,009   | 3,201   | 4,147   | 4,048   | 4,453   | 4,605   | 4,636   | 4,559   | 4,489   |
| Rubber .......   | Lb.     | 917     | 862     | 805     | 57      | 569     | 1,149   | 1,107   | 1,548   | 1,572   |
|                  | :       | :       | :       | :       | :       | :       | :       | :       | :       | :       |

TABLE 3.—Principal Philippine exports, 1920-1938

|                | CENTRIFUGAL SUGAR |              |            | REFINED SUGAR    |              |            | COPRA            |              |            | DESICCATED COCONUT |              |            |        |
|----------------|-------------------|--------------|------------|------------------|--------------|------------|------------------|--------------|------------|--------------------|--------------|------------|--------|
|                | TO UNITED STATES  | TOTAL        | PERCENTAGE | TO UNITED STATES | TOTAL        | PERCENTAGE | TO UNITED STATES | TOTAL        | PERCENTAGE | TO UNITED STATES   | TOTAL        | PERCENTAGE |        |
|                | 1,000 pounds      | 1,000 pounds | Percent    | 1,000 pounds     | 1,000 pounds | Percent    | 1,000 pounds     | 1,000 pounds | Percent    | 1,000 pounds       | 1,000 pounds | Percent    |        |
| 1920 . . . . . | 90,920:           | 117,276:     | 77.53:     | 92,39:           | 107:         | 57.14:     | 3,159:           | 56,885:      | 5.56:      | -:                 | -:           | -:         |        |
| 1921 . . . . . | 330,842:          | 358,087:     | 92.39:     | 2:               | 37:          | 5.41:      | 116,687:         | 331,429:     | 35.21:     | -:                 | -:           | -:         |        |
| 1922 . . . . . | 524,135:          | 524,318:     | 99.97:     | 10:              | 747:         | 10.77:     | 100,00:          | 196,999:     | 381,510:   | 51.64:             | 2,116:       | 2,116:     |        |
| 1923 . . . . . | 498,614:          | 498,614:     | 100.00:    | 1:               | 876:         | 1.876:     | 100,00:          | 284,964:     | 456,641:   | 62,40:             | 9,583:       | 100.00:    |        |
| 1924 . . . . . | 653,095:          | 653,095:     | 100.00:    | 9:               | 987:         | 9.989:     | 99.98:           | 237,054:     | 345,598:   | 68,59:             | 17,917:      | 17,932:    |        |
| 1925 . . . . . | 1,012,513:        | 1,012,513:   | 100.00:    | 9:               | 314:         | 9.314:     | 100.00:          | 256,082:     | 323,435:   | 79.18:             | 27,582:      | 27,608:    |        |
| 1926 . . . . . | 748,464:          | 748,464:     | 100.00:    | 3:               | 986:         | 3.986:     | 100.00:          | 284,572:     | 383,647:   | 74.18:             | 31,554:      | 31,588:    |        |
| 1927 . . . . . | 1,116,592:        | 1,116,592:   | 100.00:    | 4:               | 052:         | 4.052:     | 100.00:          | 347,745:     | 439,419:   | 79.18:             | 33,475:      | 99.78:     |        |
| 1928 . . . . . | 1,160,140:        | 1,160,140:   | 100.00:    | 17:              | 734:         | 17.734:    | 100.00:          | 402,529:     | 516,796:   | 77.89:             | 44,886:      | 44,897:    |        |
| 1929 . . . . . | 1,463,876:        | 1,463,876:   | 100.00:    | 15:              | 456:         | 15.456:    | 100.00:          | 285,756:     | 362,659:   | 74.68:             | 49,123:      | 49,132:    |        |
| 1930 . . . . . | 1,564,620:        | 1,564,620:   | 100.00:    | 60:              | 344:         | 60,344:    | 100.00:          | 311,206:     | 384,262:   | 80.99:             | 43,935:      | 43,944:    |        |
| 1931 . . . . . | 1,569,331:        | 1,569,331:   | 100.00:    | 89:              | 231:         | 89,231:    | 100.00:          | 266,503:     | 384,127:   | 69.38:             | 37,084:      | 37,086:    |        |
| 1932 . . . . . | 2,114,610:        | 2,114,610:   | 100.00:    | 125:             | 940:         | 125,940:   | 100.00:          | 183,404:     | 302,562:   | 60.50:             | 35,432:      | 35,435:    |        |
| 1933 . . . . . | 2,256,205:        | 2,256,205:   | 100.00:    | 121:             | 753:         | 121,753:   | 100.00:          | 458,559:     | 680,677:   | 67.37:             | 39,498:      | 39,522:    |        |
| 1934 . . . . . | 2,411,795:        | 2,411,795:   | 100.00:    | 129:             | 622:         | 129,622:   | 100.00:          | 338,371:     | 755,530:   | 44.79:             | 51,887:      | 100.00:    |        |
| 1935 . . . . . | 1,010,448:        | 1,010,448:   | 100.00:    | 127:             | 635:         | 127,635:   | 100.00:          | 458,764:     | 557,543:   | 82.28:             | 74,811:      | 74,886:    |        |
| 1936 . . . . . | 1,869,148:        | 1,869,148:   | 100.00:    | 114:             | 630:         | 114,630:   | 100.00:          | 402,390:     | 641,733:   | 62,70:             | 73,433:      | 98.80:     |        |
| 1937 . . . . . | 1,792,018:        | 1,792,018:   | 99.67:     | 122:             | 005:         | 122,005:   | 100.00:          | 457,391:     | 521,485:   | 87.71:             | 89,231:      | 100.00:    |        |
| 1938 . . . . . | 1,803,513:        | 1,803,513:   | 100.00:    | 110:             | 627:         | 110,627:   | 100.00:          | 501,419:     | 754,121:   | 66.49:             | 75,525:      | 99.94:     |        |
|                | COCONUT OIL       |              |            | ABACÁ            |              |            | LEAF TOBACCO     |              |            | CIGARS             |              |            |        |
|                | 1,000 pounds      | 1,000 pounds | Percent    | 1,000 pounds     | 1,000 pounds | Percent    | 1,000 pounds     | 1,000 pounds | Percent    | 1,000 pounds       | 1,000 pounds | Percent    |        |
| 1920 . . . . . | 158,610:          | 171,013:     | 92.75:     | 147,801:         | 311,920:     | 47.38:     | 855:             | 43,960:      | 1.95:      | 714,484:           | 929,338:     | 76.88:     |        |
| 1921 . . . . . | 177,479:          | 199,058:     | 89.16:     | 76,187:          | 221,346:     | 34.42:     | 86:              | 48,351:      | 0.18:      | 165,358:           | 341,446:     | 48.43:     |        |
| 1922 . . . . . | 235,110:          | 236,351:     | 99.47:     | 184:             | 183:         | 379,251:   | 48.56:           | 31:          | 33,356:    | 0.09:              | 399,194:     | 661,667:   | 60.33: |
| 1923 . . . . . | 186,835:          | 196,643:     | 95.03:     | 181:             | 813:         | 433,076:   | 41.98:           | 326:         | 53,528:    | 0.61:              | 500,107:     | 618,952:   | 80.80: |
| 1924 . . . . . | 243,734:          | 246,097:     | 99.04:     | 170:             | 237:         | 390,902:   | 43.55:           | 99:          | 47,805:    | 0.21:              | 407,218:     | 491,921:   | 84.50: |
| 1925 . . . . . | 212,466:          | 229,561:     | 92.55:     | 132:             | 104:         | 332,948:   | 39.68:           | 31:          | 36,559:    | 0.08:              | 473,006:     | 556,778:   | 84.95: |
| 1926 . . . . . | 253,379:          | 258,580:     | 97.99:     | 136:             | 374:         | 339,603:   | 40.16:           | 40:          | 31,612:    | 0.13:              | 449,088:     | 546,104:   | 82.23: |
| 1927 . . . . . | 312,147:          | 319,233:     | 97.78:     | 107:             | 027:         | 328,102:   | 32.62:           | 190:         | 52,004:    | 0.37:              | 383,093:     | 457,629:   | 83.71: |
| 1928 . . . . . | 310,483:          | 313,589:     | 99.01:     | 112:             | 682:         | 385,355:   | 29.24:           | 205:         | 44,570:    | 0.46:              | 413,250:     | 486,961:   | 84.86: |
| 1929 . . . . . | 415,982:          | 420,018:     | 99.04:     | 149:             | 701:         | 417,604:   | 35.85:           | 146:         | 60,801:    | 0.24:              | 349,334:     | 415,199:   | 84.14: |
| 1930 . . . . . | 322,103:          | 324,881:     | 99.14:     | 129:             | 419:         | 317,219:   | 40.80:           | 461:         | 45,792:    | 1.06:              | 336,320:     | 393,656:   | 85.43: |
| 1931 . . . . . | 327,897:          | 363,693:     | 90.16:     | 61:              | 513:         | 291,259:   | 21.12:           | 282:         | 49,941:    | 0.56:              | 365,840:     | 846,289:   | 43.23: |
| 1932 . . . . . | 243,077:          | 252,808:     | 96.15:     | 55:              | 419:         | 233,214:   | 23.76:           | 47:          | 663:       | 0.99:              | 375,126:     | 402,505:   | 93.20: |
| 1933 . . . . . | 347,244:          | 351,900:     | 98.68:     | 79:              | 782:         | 335,245:   | 23.80:           | 170:         | 37,251:    | 0.46:              | 407,679:     | 432,412:   | 94.28: |
| 1934 . . . . . | 299,687:          | 319,305:     | 93.86:     | 92:              | 772:         | 384,703:   | 24.12:           | 84:          | 28,944:    | 0.29:              | 459,331:     | 491,229:   | 93.50: |
| 1935 . . . . . | 357,562:          | 364,187:     | 98.18:     | 98:              | 047:         | 414,908:   | 23.63:           | 29:          | 49,412:    | 0.06:              | 459,163:     | 491,884:   | 93.35: |
| 1936 . . . . . | 332,742:          | 351,905:     | 94.55:     | 83:              | 424:         | 368,415:   | 22.64:           | 55:          | 31,839:    | 0.17:              | 360,494:     | 393,155:   | 91.59: |
| 1937 . . . . . | 353,452:          | 358,838:     | 98.50:     | 89:              | 672:         | 364,506:   | 24.60:           | 79:          | 17,804:    | 0.44:              | 409,445:     | 451,105:   | 90.76: |
| 1938 . . . . . | 351,918:          | 363,885:     | 96.71:     | 61:              | 215:         | 311,543:   | 19.65:           | 366:         | 21,689:    | 1.69:              | 406,116:     | 433,632:   | 93.65: |

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TABLE 4. Principal Philippine agricultural imports, by value, 1920-1938

|      | WHEAT FLOUR              |       |                                        | COTTON AND MANUFACTURES  |        |                                        | FRUITS AND NUTS          |       |                                        | TOBACCO AND PRODUCTS     |         |                                        |
|------|--------------------------|-------|----------------------------------------|--------------------------|--------|----------------------------------------|--------------------------|-------|----------------------------------------|--------------------------|---------|----------------------------------------|
|      | FROM<br>UNITED<br>STATES | TOTAL | PERCENTAGE<br>FROM<br>UNITED<br>STATES | FROM<br>UNITED<br>STATES | TOTAL  | PERCENTAGE<br>FROM<br>UNITED<br>STATES | FROM<br>UNITED<br>STATES | TOTAL | PERCENTAGE<br>FROM<br>UNITED<br>STATES | FROM<br>UNITED<br>STATES | TOTAL   | PERCENTAGE<br>FROM<br>UNITED<br>STATES |
|      |                          |       |                                        |                          |        |                                        |                          |       |                                        |                          |         |                                        |
| 1920 | 1,818                    | 4,722 | 38.5                                   | 22,325                   | 34,680 | 64.4                                   | 770                      | 1,394 | 55.2                                   | 1,603                    | 1,864   | 86.0                                   |
| 1921 | 2,377                    | 3,508 | 64.9                                   | 9,430                    | 19,430 | 48.5                                   | 649                      | 1,058 | 61.3                                   | 1,852                    | 2,151   | 86.1                                   |
| 1922 | 2,241                    | 2,892 | 77.5                                   | 16,112                   | 23,615 | 68.2                                   | 431                      | 788   | 54.7                                   | 1,014                    | 1,240   | 81.8                                   |
| 1923 | 2,807                    | 3,498 | 80.2                                   | 13,596                   | 23,135 | 58.8                                   | 694                      | 1,055 | 65.8                                   | 1,042                    | 1,176   | 88.6                                   |
| 1924 | 3,374                    | 4,021 | 83.9                                   | 12,514                   | 24,690 | 69.5                                   | 1,003                    | 69.2  | 1,320                                  | 1,506                    | 87.7    | 87.7                                   |
| 1925 | 4,726                    | 5,606 | 84.3                                   | 14,459                   | 27,598 | 52.4                                   | 824                      | 1,162 | 70.9                                   | 1,702                    | 1,832   | 92.9                                   |
| 1926 | 3,983                    | 4,862 | 81.9                                   | 16,396                   | 28,235 | 58.1                                   | 852                      | 1,150 | 74.1                                   | 1,968                    | 2,148   | 91.6                                   |
| 1927 | 4,220                    | 4,866 | 86.7                                   | 12,156                   | 23,042 | 52.8                                   | 864                      | 1,248 | 69.2                                   | 2,464                    | 2,746   | 89.7                                   |
| 1928 | 4,625                    | 5,326 | 86.6                                   | 15,398                   | 28,136 | 54.7                                   | 1,236                    | 1,645 | 75.1                                   | 3,101                    | 3,101   | 96.4                                   |
| 1929 | 4,348                    | 5,060 | 85.9                                   | 15,848                   | 26,977 | 58.8                                   | 1,234                    | 1,702 | 72.5                                   | 3,151                    | 3,270   | 96.4                                   |
| 1930 | 3,981                    | 4,491 | 88.6                                   | 8,650                    | 18,514 | 46.7                                   | 1,104                    | 1,493 | 73.9                                   | 2,804                    | 2,944   | 95.2                                   |
| 1931 | 2,702                    | 3,214 | 84.1                                   | 8,110                    | 16,401 | 49.4                                   | 1,080                    | 1,459 | 74.0                                   | 2,669                    | 2,722   | 98.1                                   |
| 1932 | 1,943                    | 2,452 | 79.2                                   | 10,574                   | 16,762 | 63.1                                   | 886                      | 1,234 | 71.8                                   | 2,627                    | 2,693   | 97.6                                   |
| 1933 | 1,636                    | 2,216 | 73.8                                   | 8,362                    | 13,132 | 62.9                                   | 674                      | 960   | 70.2                                   | 2,084                    | 2,120   | 98.3                                   |
| 1934 | 1,817                    | 2,624 | 69.2                                   | 7,822                    | 15,622 | 50.1                                   | 898                      | 1,157 | 77.6                                   | 2,858                    | 2,927   | 97.6                                   |
| 1935 | 2,229                    | 2,850 | 42.8                                   | 6,766                    | 15,300 | 44.2                                   | 990                      | 1,322 | 74.9                                   | 3,696                    | 3,750   | 98.6                                   |
| 1936 | 3,946                    | 3,950 | 39.1                                   | 6,782                    | 15,268 | 44.4                                   | 1,089                    | 1,417 | 76.8                                   | 3,516                    | 3,566   | 98.6                                   |
| 1937 | 1,574                    | 4,102 | 38.4                                   | 4,858                    | 10,678 | 45.5                                   | 762                      | 1,196 | 63.7                                   | 3,626                    | 3,670   | 98.8                                   |
| 1938 | 3,256                    | 5,132 | 63.4                                   | 11,018                   | 14,374 | 76.6                                   | 1,284                    | 1,725 | 74.4                                   | 7,900                    | 7,934   | 99.6                                   |
|      | VEGETABLES               |       |                                        | DAIRY PRODUCTS*          |        |                                        | MEAT AND PRODUCTS        |       |                                        | TOTAL                    |         |                                        |
| 1920 | 688                      | 1,732 | 39.7                                   | 2,658                    | 3,180  | 83.6                                   | 600                      | 2,622 | 22.9                                   | 94,132                   | 149,438 | 63.0                                   |
| 1921 | 363                      | 1,413 | 25.7                                   | 1,880                    | 2,562  | 86.7                                   | 786                      | 1,128 | 25.1                                   | 75,058                   | 115,838 | 64.8                                   |
| 1922 | 385                      | 1,332 | 28.9                                   | 1,096                    | 1,962  | 55.9                                   | 304                      | 2,312 | 13.2                                   | 80,198                   | 80,198  | 59.9                                   |
| 1923 | 398                      | 1,383 | 28.8                                   | 1,678                    | 2,432  | 57.0                                   | 370                      | 1,872 | 19.8                                   | 50,654                   | 87,634  | 57.8                                   |
| 1924 | 422                      | 1,492 | 28.3                                   | 2,229                    | 2,799  | 79.6                                   | 383                      | 2,132 | 18.0                                   | 61,332                   | 108,011 | 56.8                                   |
| 1925 | 576                      | 1,880 | 30.6                                   | 2,426                    | 2,905  | 83.5                                   | 523                      | 2,564 | 20.4                                   | 70,154                   | 119,732 | 58.6                                   |
| 1926 | 532                      | 1,900 | 28.0                                   | 2,681                    | 3,258  | 82.3                                   | 512                      | 2,697 | 19.0                                   | 71,723                   | 119,298 | 60.1                                   |
| 1927 | 536                      | 1,810 | 29.6                                   | 2,713                    | 3,291  | 82.4                                   | 570                      | 2,918 | 19.5                                   | 72,196                   | 115,902 | 62.3                                   |
| 1928 | 677                      | 2,041 | 32.2                                   | 3,001                    | 3,716  | 80.8                                   | 719                      | 2,958 | 24.3                                   | 84,354                   | 134,657 | 62.6                                   |
| 1929 | 720                      | 2,164 | 33.3                                   | 3,034                    | 3,832  | 79.2                                   | 636                      | 3,062 | 20.8                                   | 92,748                   | 147,160 | 63.0                                   |
| 1930 | 674                      | 1,846 | 36.5                                   | 2,927                    | 3,589  | 81.6                                   | 524                      | 2,041 | 25.7                                   | 78,480                   | 123,093 | 63.8                                   |
| 1931 | 696                      | 1,862 | 37.4                                   | 3,261                    | 4,079  | 80.0                                   | 401                      | 1,996 | 20.1                                   | 62,374                   | 99,178  | 62.9                                   |
| 1932 | 563                      | 1,551 | 36.7                                   | 1,894                    | 2,602  | 72.8                                   | 454                      | 1,462 | 31.0                                   | 51,492                   | 79,195  | 64.9                                   |
| 1933 | 540                      | 2,118 | 44.3                                   | 1,141                    | 2,246  | 64.2                                   | 417                      | 1,018 | 41.0                                   | 43,786                   | 67,362  | 65.0                                   |
| 1934 | 721                      | 1,405 | 51.3                                   | 2,083                    | 2,912  | 71.5                                   | 687                      | 1,204 | 57.1                                   | 54,680                   | 83,607  | 65.4                                   |
| 1935 | 834                      | 1,639 | 50.9                                   | 1,625                    | 3,076  | 52.8                                   | 940                      | 1,576 | 54.6                                   | 54,793                   | 83,524  | 64.0                                   |
| 1936 | 834                      | 1,692 | 49.3                                   | 1,225                    | 4,068  | 30.0                                   | 892                      | 1,444 | 61.8                                   | 61,852                   | 101,126 | 61.2                                   |
| 1937 | 742                      | 1,752 | 42.4                                   | 959                      | 3,720  | 25.8                                   | 632                      | 1,322 | 47.8                                   | 63,656                   | 109,026 | 68.4                                   |
| 1938 | 936                      | 1,993 | 47.0                                   | 1,094                    | 4,474  | 24.4                                   | 602                      | 1,515 | 39.7                                   | 90,778                   | 132,608 | 68.5                                   |

The Foreign Trade of the Philippines, Office of American Trade Commissioner, Manila.

## Foreign Agriculture

TABLE 5.—United States imports of crude drugs which could be supplied by the Philippine Islands,  
1930-1938; average 1934-1938

| YEAR ENDED<br>DECEMBER 31 | ALOES  | BELLA-<br>DONNA | CAMO-<br>MILE | CINCHONA | NUX<br>VOMICA | SARSA-<br>PARILLA | PAPAIN<br>(CRUDE) | STRAMO-<br>NIUM | COCA<br>LEAVES | JALAP<br>ROOT | IPECAC  |
|---------------------------|--------|-----------------|---------------|----------|---------------|-------------------|-------------------|-----------------|----------------|---------------|---------|
| QUANTITY:                 | pounds | pounds          | pounds        | pounds   | pounds        | pounds            | pounds            | pounds          | pounds         | pounds        | pounds  |
| 1930 . . . . .            | 1,000  | : 1,000         | : 1,000       | : 1,000  | : 1,000       | : 1,000           | : 1,000           | : 1,000         | : 1,000        | : 1,000       | : 1,000 |
| 1931 . . . . .            | 1,005  | :               | 85            | 165      | 1,939         | 2,198             | 141               | 76              | 413            | 199           | 95      |
| 1932 . . . . .            | 659    | :               | 215           | 193      | 1,581         | 1,925             | 142               | 65              | 304            | 491           | 106     |
| 1933 . . . . .            | 780    | :               | 103           | 142      | 1,139         | 957               | 76                | 54              | 151            | 224           | 57      |
| 1934 . . . . .            | 649    | :               | 191           | 124      | 1,814         | 2,593             | 65                | 83              | 342            | 690           | 89      |
| 1935 . . . . .            | 787    | :               | 195           | 213      | 1,690         | 5,867             | 114               | 111             | 348            | 180           | 73      |
| 1936 . . . . .            | 882    | :               | 208           | 139      | 1,618         | 2,888             | 109               | 116             | 404            | 245           | 96      |
| 1937 . . . . .            | 746    | :               | 248           | 160      | 2,051         | 2,512             | 101               | 204             | 259            | 380           | 89      |
| 1938 . . . . .            | 719    | :               | 324           | 136      | 1,837         | 2,739             | 148               | 225             | 320            | 422           | 109     |
| Average:                  | 578    | :               | 83            | 123      | 1,349         | 1,083             | 84                | 232             | 320            | 465           | 90      |
| 1934-1938:                | 742    | :               | 212           | 154      | 1,709         | 3,018             | 111               | 178             | 330            | 338           | 91      |
| Value:                    | 1,000  | :               | 1,000         | 1,000    | 1,000         | 1,000             | 1,000             | 1,000           | 1,000          | 1,000         | 1,000   |
| 1930 . . . . .            | 197    | :               | 10            | 19       | 584           | 50                | 21                | 174             | 32             | 39            | 19      |
| 1931 . . . . .            | 114    | :               | 21            | 21       | 424           | 58                | 17                | 121             | 21             | 93            | 17      |
| 1932 . . . . .            | 70     | :               | 7             | 17       | 358           | 23                | 11                | 51              | 8              | 51            | 8       |
| 1933 . . . . .            | 50     | :               | 18            | 14       | 560           | 47                | 7                 | 79              | 20             | 32            | 12      |
| 1934 . . . . .            | 96     | :               | 26            | 24       | 668           | 113               | 10                | 189             | 37             | 39            | 10      |
| 1935 . . . . .            | 140    | :               | 21            | 25       | 631           | 65                | 15                | 215             | 28             | 41            | 11      |
| 1936 . . . . .            | 122    | :               | 24            | 26       | 745           | 62                | 14                | 229             | 16             | 68            | 12      |
| 1937 . . . . .            | 146    | :               | 28            | 22       | 761           | 74                | 18                | 268             | 21             | 71            | 15      |
| 1938 . . . . .            | 162    | :               | 7             | 17       | 588           | 17                | 9                 | 344             | 24             | 83            | 9       |
| Average:                  | 133    | :               | 21            | 23       | 679           | 66                | 13                | 249             | 25             | 60            | 11      |
| 1934-1938:                | 133    | :               | 21            | 23       | 679           | 66                | 13                | 249             | 25             | 60            | 11      |

Compiled from Foreign Commerce and Navigation of the United States by Bureau of Plant Industry, Manila.